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VOL LXI

10 SEPTEMBER 1949

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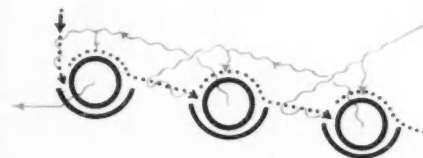
Counter - Current Washing



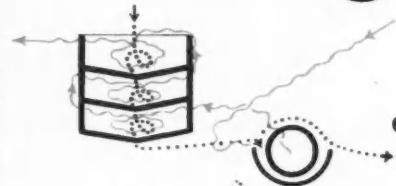
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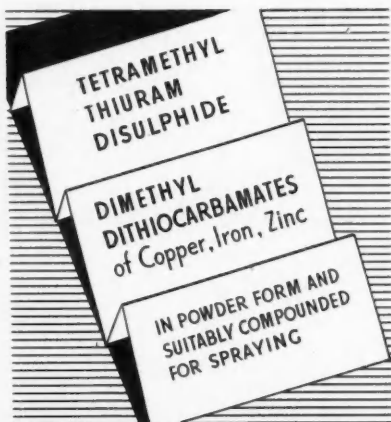
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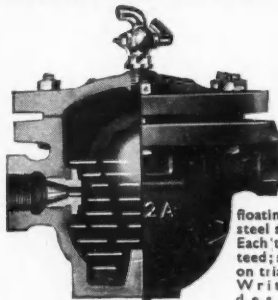
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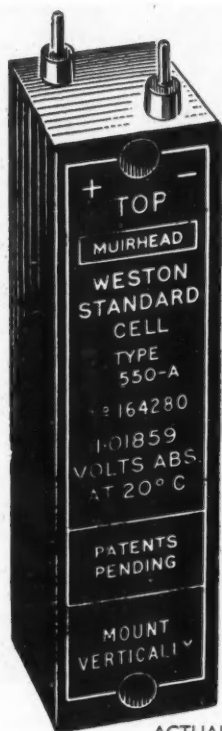
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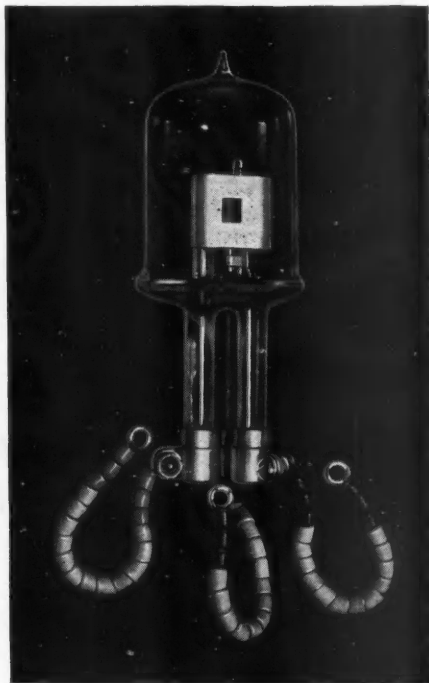
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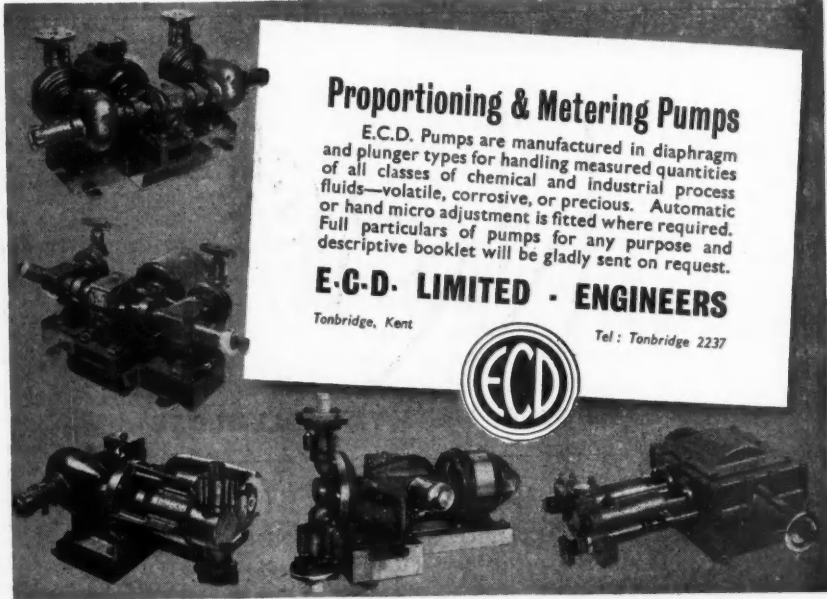
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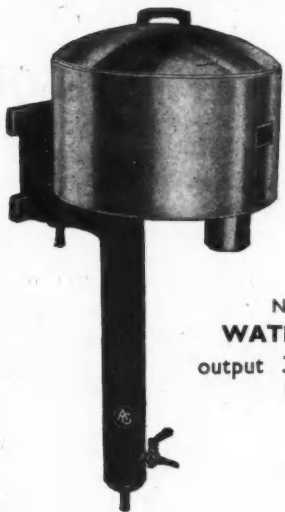


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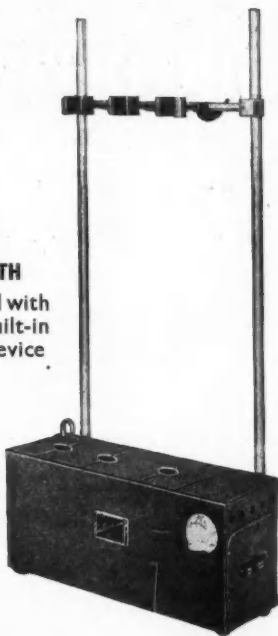
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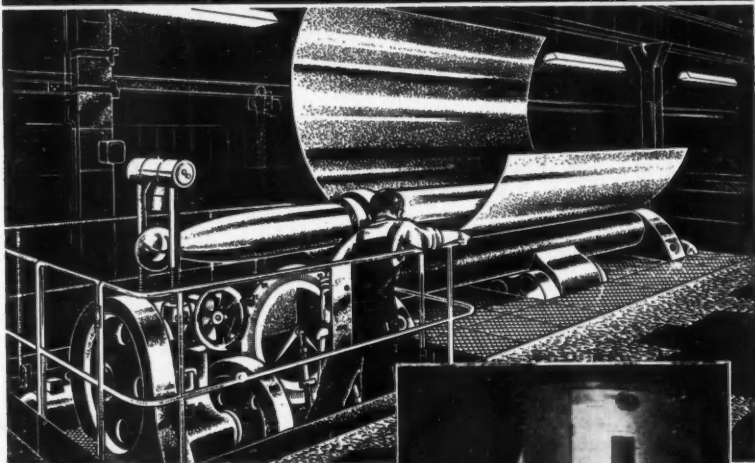
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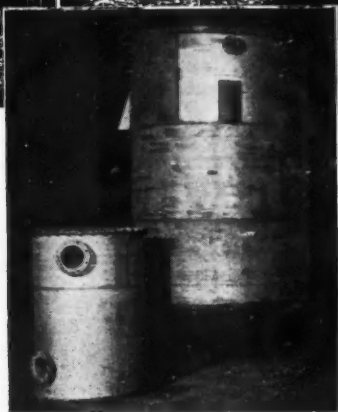
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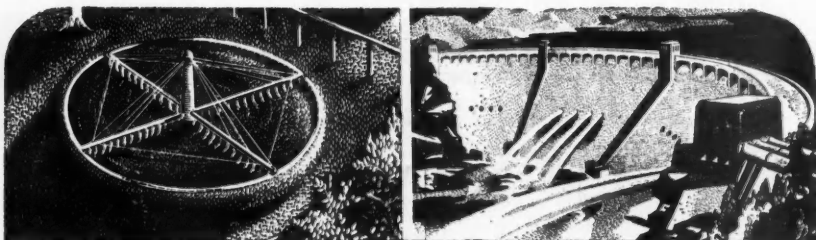
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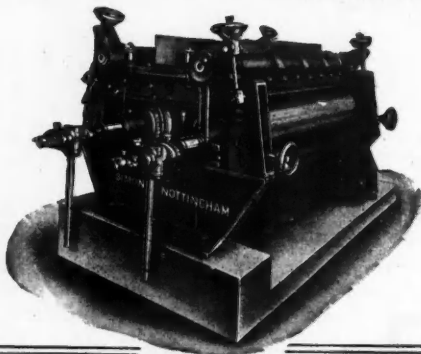
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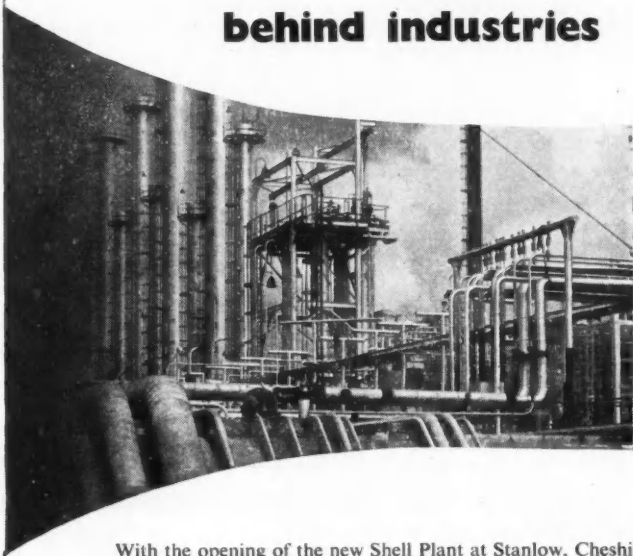
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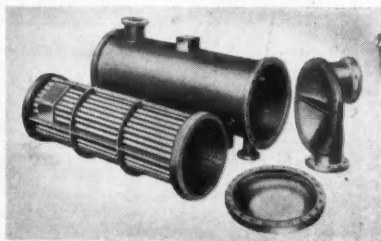
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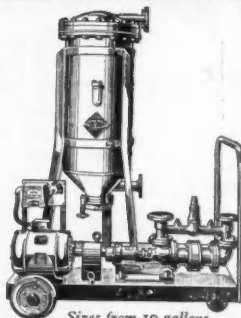
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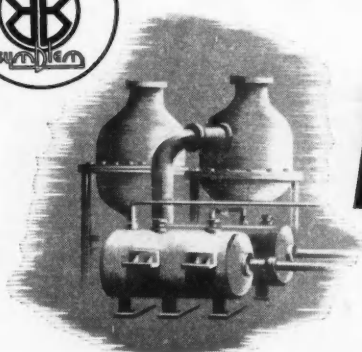
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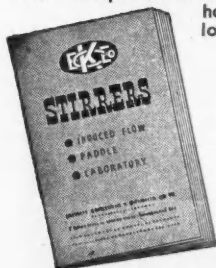
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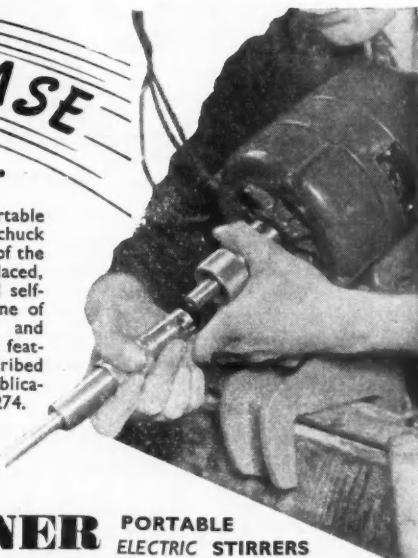
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Volume LXI

10 September 1949

Number 1574

The Seaweed Source of Chemicals

THE considerable value of seaweed as a source of a wealth of pharmacological, chemical and industrial extracts of high value is an established fact, to which several recent authoritative publications have added a useful technical commentary. The conclusion which must be drawn from all the evidence which has lately come to hand is that there is around these coasts, and especially on the Western seaboard, a great source of useful materials offering a potential return valuable enough to ensure that the serious technical problems of recovery will ultimately be overcome.

That stage has not yet been reached. Evidence of that is given indirectly in last week's official publication, "A Study of British Seaweeds,"* and perhaps rather more pointedly by the information lately released by the Scottish Seaweed Research Association, whose record in the commercial exploitation of algæ bears witness to a very vigorous approach which has begun to yield some substantial commercial rewards.

The official review, sponsored by the Ministry of Health and the Ministry of Supply, bears the hall marks of a closely integrated and planned

approach to the problems of making seaweed serve as a chemical raw material. Quite rightly, it does not seek short cuts or spare any detail which may be of value to other workers in the same field; in addition, it supplies, for the first time at full length, an account of the first serious work to make British seaweed a source of agar. That began when war deprived this country of the Japanese supply and simultaneously made agar more necessary than ever before for bacteriological work. Agar had to be procured quickly in relatively large quantities and the official research team secured that result. Much of the work which is now described was part of that project, the urgency of which did not deter the volunteer team—of which S. M. Marshall, Professor Lily Newton and H. P. Orr were the principals—from making a meticulously detailed and painstaking survey of the character and distribution of algal supplies and of some chemical treatments. Inevitably, however, this research does not survey all the possibilities and emphasis in nearly all the chapters is upon the red seaweeds *Gigartina Stellata* Batt. and *Chondrus Crispus* (L) Stackh., which preliminary surveys indicated to be the most readily procured of the varieties

* "A Study of Certain British Seaweeds and their Utilisation in the Preparation of Agar," by S. M. Marshall, L. Newton and A. P. Orr. (H.M.S.O. 27s. 6d. net.)

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from which suitable agar can be produced. The field was narrowed with the course of further work by the discovery that *Chondrus* was relatively harder to procure, so that the principal interest in the published result centres round *Gigartina*. So far as that species is concerned, "A Study of Certain British Seaweeds" richly deserves to be accepted as the standard work for those concerned chiefly with agar.

This survey, revealing as it is, is prone, however, to obscure from view some very much wider prospects afforded by other seaweeds and other uses. The foremost authority in these other departments now is the Scottish Seaweed Research Association, which represents the outcome of a most promising kind of collaboration by Government departments and Scottish industrial interests. Having objectives far less specialised than that of the authors of the official report, the Scottish association seems to have travelled very much further towards the fuller exploitation of marine algæ. It has inherited the results of the war-time work and has added an ample contribution of its own, concerned with the brown seaweeds, occurring

abundantly in Scottish waters. That policy promises to represent the entire prospect in relation to seaweed in a much wider and more promising context. To supply all our own needs of agar alone is a sufficiently desirable objective, economically and strategically, but the Scottish research seems to indicate clearly a good prospect of yielding in bulk the source of protein, carbohydrates and many extracts.

Equally promising is the evidence of continuing sources of suitable seaweed yielded by the association's surveys, showing, for example, that round Orkney alone some 1.2 million tons of sub-littoral weed grows in easily accessible waters from 1 to 6 fathoms, a density of 20 tons per acre. The novel problems of harvesting so unusual a crop seem now to be much more of an impediment than the technology of converting the various algæ into industrial materials. Basically the latter is far simpler than that of many common chemicals. The immediate responsibility now appears to rest upon the engineers, to offer a practicable and inexpensive method of cutting and recovery. The size of the benefits to be had suggest that they will not fail to supply the means.

Notes and Comments

Shadow of Overproduction

THE knowledge that few world markets for primary industrial materials, such as chemicals, could re-form in precisely the same shape as they presented before the war has been underlined repeatedly since 1946. Reports since then of large production schemes by "consumer countries, to relieve their pressing shortages of essentials which imports formerly provided in ample quantities, have foreshadowed big changes in the old ratio of supply and demand and the evident possibility of temporary over-production. In the report which the Chemical Products Committee of OEEC has just published the seriously unbalanced ratio between production proposed in the co-operating countries in 1952 and estimated needs stands out conspicuously. Summarising the estimates disclosed by the majority of countries, this indicates the possibility that by 1952-53 nitrogen fertilisers may be produced at an annual rate of 2,187,000 metric tons of pure nitrogen, demand for which is not expected to exceed 1,867,900 metric tons, and production and use of soluble phosphates may be, respectively, 3,314,000 and 2,847,500 metric tons. France, Italy and the Benelux countries are shown as the potential sources of the great productive increases and, excepting France, have based their proposals on the prospect of largely increased overseas sales. In uncertain trading conditions, that outlet may never fully materialise, and the Chemical Products Committee does not conceal the fact that prudent adjustment of plans for new capacity is urgently called for. That warning seems to apply with even more force to the international programmes for plastics raw materials and dyestuffs, of which the proposed rise in production is proportionately much larger.

German Objectives

THE first issue of the revived *Chemische Industrie* (July), before the war one of Germany's leading

trade and technical publications, dating back about 60 years, is of exceptional interest for several reasons—political, economic, and technical. The printing and general get-up are excellent, and the quality of the paper does not suggest any austerity. The post-war objectives of *Chemische Industrie*, described in a prefatory note, are of a kind to appeal to everyone: to give a full and accurate picture of German chemical industry to all, at home and overseas; to promote better understanding among the nations, so far as this is possible by frank discussion of mutual economic interests in chemical industry, as some contribution towards peaceful work throughout the world. That ideal is unquestionably sincere, yet there are already indications that, under present conditions in Germany, the disinterested standpoint is not easily preserved. One is reminded of this in the course of the economic reviews of German chemical industry by W. A. Menne, president of Arbeitsgemeinschaft Chemische Industrie, which discloses something of the bitterness of spirit which the spectacle of a great industry in adversity has engendered in some Germans, while at the same time hardening their determination to persevere against all difficulties. It is not to be expected that German writers should give much thought at this stage to the bitter seeds of a past decade of which the present hardships are the fruit. Discussing all such considerations, one writer at least is able to present an imposing indictment of some aspects of the dismantling policy and especially of the indiscriminating ban on the Fischer-Tropsch plants and processes, and the virtual exclusion of German chemists from the potent field of catalysis in a department in which they were pioneers. The salvaging of at least specialised and "inoffensive" sections of the F-T plant is evidently high in the list of German chemical objectives.

Atomic Safety Measures

ONE tangible benefit accruing from the agreement of the U.K., Canada and the U.S.A. to pool certain scientific and technical knowledge of atomic energy has been a series of meetings this week at the atomic energy research establishment at Harwell, Berkshire, at which specialists of the three countries have compared experiences of hazards and safety measures. The disposal of radioactive wastes remains one of the fundamental problems which would complicate the operation on a large scale of the chain reactors which may be set up in the future, if nothing better than the present laborious screening has been devised. At present some of these highly energised unwanted materials are enveloped in concrete "coffins" and given a sea burial, remotely and at a depth which should ensure that they do not emulate the disconcerting habits of "rogue" sea mines. This and the elimination of radioactivity from the vast flow of cooling water required in operating piles must be problems common to America's Atomic Energy Commission and the Chalk River project, each of which is represented by several principal scientists at Harwell now, notably Dr. Edward Teller, of the AEC, and Dr. W. B. Lewis, director of Chalk River Laboratory. The British contributors to the talks include Dr. H. W. B. Skinner and six other specialists at Harwell and three members of the Department of Atomic Energy (Production).

Clearing the Air

BELATEDLY there has been published (under date of September 1) a report on observations made in the five years ended March 31, 1944, by the Atmospheric Pollution Research Committee of the DSIR, which works with the aid of the standing conference of co-operating bodies from which most of the local information is derived. The data published serve to underline the rule that the invisible pollution of the atmosphere by sul-

phur gases is almost directly proportional to the quantity of coal burned, irrespective of the size or type of the combustion appliance used. This seems to be a direct pointer to the need—which has been so often stressed—for the treatment of a larger proportion of coal at or near its source. This aspect of the problem, and the possibility of the fuel treatment being made economically more attractive by the recovery of by-products is, however, not one of the concerns of the present report, which confines itself mainly to a description of the various known methods of measurement of atmospheric pollution and a comparison of the yield obtained. One of the interesting features given in graph form is the series of fluctuations in sulphur-dioxide measurements (by the lead-peroxide method) at a group of 20 stations during 1935-1944. The readings of sulphation—mg. of sulphur-dioxide/day/100 cm²—taken, for example, at City Hall, Cardiff, during this period, range between 0.5 and 2 mg., compared with readings at London (County Hall laboratory roof), from 0.75 to 12. London, in that respect, is at times a good deal more sulphurous than Leicester (1 to 7) or Huddersfield (1 to 4.5). The predominant responsibility of industries for the sulphur shower is reflected in the fact that from the middle of 1939 until the time of Dunkirk (when normal industries were slack) there was a corresponding fall in sulphur pollution. After Dunkirk, there was a marked and rapid increase in the consumption of coal in furthering war-time production—with the immediate result in the atmosphere of a corresponding rise in sulphur-dioxide. The report concludes on the note that, pre-war standards having been so far short of perfection, and a number of years having since gone by without any major attempts at improvement, the present rebuilding and general reconstruction offer opportunities, which must not be missed, of improving the state of the country's atmosphere.

Contemporary Tasks for Scientists

British Association Specialists and Immediate Needs



This year's president, Sir John Russell, FRS (left), who, like his predecessor, Sir Henry Tizard, has again shown how vast and varied is the task of scientists to safeguard the basis of all human advancement—adequate nutrition. The next presidents were announced to be Sir Harold Hartley (right) and the Duke of Edinburgh (1951)



SIR HAROLD HARTLEY was appointed president of the British Association for the Advancement of Science for 1950 at the annual meetings in Newcastle-on-Tyne last week. Sir Harold Hartley, a Fellow of the Royal Society, was natural science tutor and Bedford Lecturer in physical chemistry from 1901 to 1931 and has published a number of papers on chemistry and industrial research. During the 1914-18 war he was chemical adviser to the 3rd Army, assistant director, Gas Services, and controller, Chemical Warfare Department. In the last war he was scientific adviser to Mr. Geoffrey Lloyd at the Petroleum Warfare Department in the development of FIDO. From 1932-47 he was chairman of the Fuel Research Board and has been chairman of the British National Committee and International Executive Council of the World Power Conference since 1935.

The Duke of Edinburgh has consented to be president of the British Association in 1951, the year of the Festival of Britain, when the association will hold its meeting in Edinburgh.

Common Needs

The week's meetings, which concluded last Wednesday, have revealed once again the association's very practical preoccupation with the scientific approach to the relief of immediate problems, national and of world wide distribution. That devotion to human affairs determined in advance the theme of the presidential address by Sir John Russell—of enlarging food supplies, with all scientific improvements of con-

ventional methods, on a scale to match the continued rise in world populations. He did not disguise the fact that science and agricultural technology alone could prove unequal to the task if birth rates in some Eastern territories continued to soar.

The same concern was evident in the papers of several other authoritative contributors and notably in Sir David Rivett's warning that Australia was far from being an inexhaustible storehouse of foodstuffs.

Coal and Chemicals

The chemist's view of the coal industry was expressed by DR. I. G. C. DRYDEN in the discussion at a joint meeting of the chemistry, geology and economics sections. He suggested that future policy should include research directed towards new chemical industries. He also foresaw the ultimate need that a proportion of miners should be so trained that they could be transferred between coal production and chemical processing as required. This would help to balance supply and demand for coal and assist in maintaining cheap fuel and price flexibility.

PROF. A. BEACHAM, speaking on the same subject, dealt with the problems faced by the Coal Board under the nationalisation Act. Emphasis, he said, was placed on output expansion, but the danger was that if production was so increased as to make it difficult or impossible to sell high-priced coal, adjustment might need to be severe.

Much greater co-operation between the Government and industrial laboratories was urged by SIR ARTHUR P. FLEMING in his presidential address to the engineering section on "Bridging the Gap Between Science and Industry." The demand for scientists and technologists in this country exceeded the supply, while the maintenance of industrial efficiency depended increasingly on scientific staffs. The importance of reducing the time lag between the discovery of a new idea and its ultimate conversion into a usable product could not be overestimated. Industrialists in the U.S.A. excelled in the speed with which they carried into effect any new project, and the value of time in making a fresh idea marketable seemed to be more acutely realised there than in this country.

Using Fission Products

In the field of nuclear physics, Sir Arthur Fleming said he thought that greater benefit would accrue to the U.S.A. from the discoveries made in this science, as a larger number of scientists were gaining experience in its practical application and would be able to turn any discoveries to practical account.

SIR HENRY TIZARD agreed that the quicker application of science to industry was essential or this country would cease to count among the great nations. He affirmed, however, that, whatever might be the cause of the delay, the quality of our fundamental research was unsurpassed. He considered that it would be many decades before nuclear energy would be of any material advantage to industry.

Enzymes and Fluorides

Accurate understanding of the chemistry of the living substance was the most powerful approach to rational control, stated PROFESSOR R. A. PETERS in his presidential address to the physiology section. He showed how an attempt to analyse the pharmacological action upon tissue cells of two very simple molecular substances (iodoacetic and fluoracetic acids) led to an application of recent biochemical research upon organised enzyme systems, indicating a central enzymic mechanism in cells.

Recent advances in the chemistry of certain inorganic fluorine compounds were discussed by PROFESSOR H. J. EMELEUS, who dealt with the progress that has been made in elucidating the structure of chlorine trifluoride, bromide trifluoride, and iodine pentafluoride.

PROFESSOR M. STACEY gave a survey of the methods available for the introduction

of fluorine into organic compounds. He also gave an account of the fluorine-containing compounds now available, their unusual properties, and gave an estimation of their future uses.

In the section on "Chemistry and the Food Supply," MR. D. D. OGLIVIE said that the chemical approach to problems of animal health was of outstanding importance. Most of the chemical effort in the past had been devoted to curing of disease; in future, more attention must be devoted to maintaining animal health. MR. L. W. L. COLE dealt with chemicals and insect control, and DR. H. S. HIRST, in "Chemicals and Grass Conservation," referred to recent progress in the chemistry of bacterial fermentation.

More Scientists Essential

A plea for scientific help in developing the resources of Australia was made by SIR DAVID RIVETT, who in 1946 was appointed chairman of the Commonwealth Council for Scientific and Industrial Research.

He affirmed that it was to scientists, working with all the aid that can be made available, that Australia must look for help. Britain's aid to such development was essential. While it was appreciated that demands on British science were very great, Sir David Rivett appealed for more team spirit to enable Australia to pull its weight in the crucial 20 years lying ahead.

U.S. Tin Proposals

UNCERTAINTY regarding future tin supplies and the effect of recent price rises are reflected in a recommendation sponsored jointly by the U.S. Senate and the House of Representatives that the Department of the Interior should stimulate the exploitation and use of American tin sources. Among the recommendations it is proposed that the U.S. Government shall give preference to domestic producers and that generally the recovery of tin from home ores and concentrates shall be given preference over smelting of imported ores.

Electronic Research

Murphy Radio, Ltd., announces an increase in its capital for the acquisition of two interests in the electro-medical field, General Radiological, Ltd., and Solus-Schall, Ltd. The acquisition marks a further step in the company's expanding research and development work in electronic fields.

THE PROPAGATION OF FLAME

Studies of Shadow Cones and Bubble Effects

AMONG the more factual technical studies contributed in the chemistry section at the British Association's meetings last week was a discussion on the propagation of flame and measurement of flame speeds by DR. J. W. LINNETT, which followed the presidential address of SIR ALFRED EGERTON ("The Study of Reaction Kinetics," *THE CHEMICAL AGE*, 61, 313).

Removing all doubt about the utility of this department of research, Dr. Linnett reminded the assembly that, although flames have been investigated for centuries our knowledge of how a flame travels through an explosive gas mixture is still uncertain. The two extreme possibilities are that (a) active atoms and radicals diffuse ahead of the flame causing the next layer to react, (b) the heat of reaction is conducted ahead so that the next layer is heated sufficiently to react violently. Probably the real situation lies between these extremes and both (a) and (b) are simultaneously important, though their relative importance may vary from case to case.

Speeds Measured

Any theory of flame propagation must be able to account for its speed of travel and how this is affected by changing conditions (pressure, inert bases, etc.). We have therefore started to measure a number of fundamental flame speeds in order to find a little more about how flames get along, reported Dr. Linnett.

We have used two methods: (i) The burner method, in which the shape of the Bunsen cone is determined. (ii) The soap-bubble method. A 3-in. soap bubble is filled with explosive gas. It is then sparked at the centre and the resulting explosion photographed by a rotating drum camera. Flames travelling across the bubble at speeds up to 4500 cm./sec., or 100 m.p.h., have been measured. Allowance is made for gas movement by determining the degree of expansion on explosion.

If a direct shadow or Schlieren shadow picture of a Bunsen cone is taken there is a sharp-edged cone on the shadow picture. Comparison with a direct photograph shows that the shadow cone is inside the visible cone. If illuminated dust particles are used to show up the flow lines it is

found that the gas flow has changed direction before the visible cone is reached, indicating that, by that stage, considerable expansion has occurred. The emission of light is therefore late in the sequence of events that constitute a flame.

We have therefore used the shadow cone to indicate the flame front and have employed this rather than the visible cone to determine flame velocities. We have studied ethylene-air flames to which N₂ and CO₂ have been added, examining also the effect of pressure on ethylene-air flames. The flame velocity increases from ca. 70 to ca. 110 cm. per sec. on passing from one atmosphere down to about a fifth of an atmosphere.

Gas Mixtures

In the soap-bubble method we have used the light emitted by the flame to photograph its movement. We have studied mixtures of ethylene and oxygen with added argon, nitrogen, helium and carbon dioxide, obtaining results for pressures between a sixth and one atmosphere. At low pressures the soap bubble is blown with a supply of the explosive gas inside an old Admiralty mine-case, 3 to 4 ft. in diameter, fitted with thick perspex windows. The mine-case can be evacuated.

For acetylene-air and acetylene-oxygen-argon flames, the flame velocity is constant from one down to a third or a quarter of an atmosphere and then decreases (in contrast with ethylene). At atmospheric pressure a 10 per cent acetylene-air mixture burns with a fundamental flame velocity of 150 cm. per sec.

Retarding Effect of CO₂

If the nitrogen is replaced by argon the flame velocity is 220 cm. per sec., and if replaced by helium, carbon dioxide or oxygen 335, 40 or 340 respectively. The smaller heat capacity of argon relative to nitrogen shows itself in the increased flame velocity.

The effect of the small and light helium atoms relative to those of argon is also apparent. The velocity with carbon dioxide present is surprisingly small. Perhaps it exerts chemical as well as physical effects.

We shall extend these results and hope that we can unravel some of the factors affecting the propagation of flame.

COMBUSTION OF COLLOIDAL POWDERS

French and American Test Methods and Effects

UNTIL approximately the last decade, the rate of combustion of colloidal powders has been determined by the Vieille method, i.e., burning to powder in a steel bomb fitted with a special recording device for indicating pressure development as a function of time. In order to deduce from the pressure/time curve the speed of combustion, it is necessary to adopt Vieille's hypothesis and admit also that cooling on the walls of the bomb is at any moment proportional to pressure.

H. Maraour (*Chim. et Ind.*, 1949, 62, (7), 22-25), recalling his own earlier work in this field, states that he had then shown that the logarithm of combustion speed is a linear function of absolute temperature T of gas evolved by the powder, and therefore Vieille's hypothesis implied also this further assumption that T is independent of pressure.

Gas Effects

If it is admitted that thermodynamic equilibrium is attained in combustion products, this second hypothesis is acceptable, at least for normal colloidal powders, with T about 2500-3000°C., since the composition of the gaseous mixture evolved is determined solely by water/gas equilibrium: $C + H_2O \rightleftharpoons CO_2 + H_2$ independently of pressure. This does not hold for very hot powders, when there is further dissociation, namely, of CO_2 and H_2O , a dissociation limited, however, by pressure.

On the other hand, in the very incomplete combustion of relatively cold powders, methane is formed and raises the temperature of gases evolved. The author has previously shown that with such powders the rates of combustion under high pressure of about 4000 kg./cm.² are higher than those calculated on assumed absence of methane (*Chim. et Ind.*, 1943, 50, 168). The thermodynamic equilibrium assumption may in such case be debated. In any case it is known that, at very low pressures—below 50 kg./cm.²—the presence of NO may be observed, the amount thereof being particularly marked under ordinary pressure. Maraour suggests that combustion may take place in three phases (*Comptes Rendus*, 1947, 225, 381; 1949, 228, 318):—

In the first phase, all the nitric acid of

the powder is set free as NO, with considerable formation of CO and H_2 and deposition of C. Temperature is low and nearly the same for all the powders (1700°C.).

The NO, in the second phase, reacts with CO and H_2 with formation of CO_2 and H_2O , the free carbon being slightly or not at all affected. Temperature is very high, and may be 1000°C. above that of the third phase. In this the free carbon reacts with CO_2 and H_2O , the gas volume increases, temperature falls, and thermodynamic equilibrium is reached.

If the first phase only applies under very low pressures it appears that the second plays a part under slightly higher pressures, the equilibrium of the third phase being only attained under high pressure, e.g., of 500-1000 kg./cm.². It thus appears that objection can be raised against Vieille's hypothesis only in the case of low pressures. This point has become of special importance now that powders are no longer used solely in guns under high pressures of 2000 kg./cm.² and over, but also under low pressures in fuses, i.e., about 50-300 kg./cm.².

Temperature and Pressure

In earlier work the author, with G. Aunis (*Chim. et Ind.*, 1942, 47, 602; 48, No. 1, 11), has investigated the law governing the speed of combustion as a function of pressure, with different types of powder, and determined the form and area of the pressure/time curve. If speed of combustion is simply proportional to pressure, namely $V = bP$, the area would be constant under all charge densities. Experiment has shown that this is not so, and that the equation should read $V = a + bP$, wherein $\log. b$ is a linear function of temperature of gases evolved. The value of a varied in these experiments between 8 and 11 mm./sec. (combustion on both sides of powder). Thus, with a normal powder SD, we may have V in mm./sec. = $10 + 0.100 P$.

This method, however, like that of Vieille, is still indirect, and it would be of considerable interest to have a direct method, such as that already described by the author (*Chim. et Ind.*, 1942, 47, 476; 1948, 50, 172). The method is based on the fact established by experiment that the speed of combustion depends on

(continued on page 350)

UTILISATION OF MARINE ALGAE

Effective Harvesting Remains the Chief Problem

by MAJ. PHILIP JACKSON, M.I.Mech.E., M.I.Chem.E.*

SEAWEEDS can be divided into four main groups according to their characteristic colours, red, green, brown and blue.

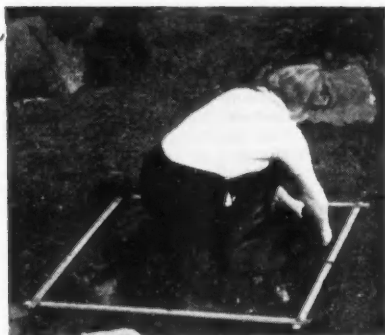
Certain red seaweeds form a source of agar, the uses of which as a culture medium in bacteriological investigations and in the fish canning and other industries, are well known. Before 1939 the bulk of the world's agar supplies came from Japan, and with the entry of that country into the second World War, the supply position became acute. As a result, investigations were initiated in Britain, as in many other countries, to examine the possibility of a local source of supply.

From the point of view of commercial utilisation, the brown seaweeds common to Scottish waters are conveniently subdivided into inter-tidal or littoral seaweeds, which are exposed at low tide (*cf. Fucaceae spp.*), totally submerged or sub-littoral seaweeds (*cf. Laminariaceae spp.*), and cast weeds or seaweeds in the second sub-classification which have been dislodged from the seabed by storms and cast on to the beaches.

Basic Materials

Previous attempts to exploit the brown seaweeds commercially as a source of soda, potash, and iodine, failed with the discovery of cheaper sources of these inorganic materials. The investigations commenced in recent years by the Scottish Seaweed Research Association, however, aimed at utilising the organic constituents, carbohydrates, proteins and the like, which to-day find wide application in all the major industrial countries in the world and on which it is fairly certain that a permanent and thriving seaweed industry can be based.

So far, alginic acid is the only organic constituent being used commercially on a large scale. While the acid itself is used in the manufacture of fibres, thickeners, protective colloids, insulating materials, etc., its real importance lies in the fact that it is the starting point for the production of alginates, which are used extensively in the food, textiles and paper



Locating the suitable seaweeds in adequate quantities is one of the formidable essentials. Here the littoral weed beds are being estimated by reference to typical sample areas from which the weed is cut, weighed and studied

industries, and in the manufacture of pharmaceutical, medical and surgical preparations.

Mannitol, another important organic constituent, is used as an inert filler in foodstuffs, as a dusting powder for chewing gum, in the manufacture of varnishes, coatings for fancy papers and leathers, shoe polishes, soldering fluxes, pharmaceutical products such as metal complexes and colloidal suspensions, and so on.

Laminarin and fucoidin are yet to be fully investigated, but it is fairly certain that new uses for these constituents will be developed when they become available in commercial quantities.

Mapping Growths

A suitable technique for surveying littoral seaweed beds quantitatively has been developed and successfully applied to the Scottish coasts, which have been found to support 180,000 tons of this type of weed growing at a density suitable for commercial exploitation. The technique used, which has been fully described by Walker (*Proc. Linn. Soc.*, 1947, 159, 90), briefly consists of dividing the coastal areas into sections determined by changes in width, substratum, weed density,

* Deputy Director of the Scottish Seaweed Research Assn. In a paper presented before the United Nations scientific conference on the conservation and utilisation of world resources.

species, etc., and determining the average density in each section by cutting and weighing the weed within chosen quadrats.

The quantitative assessment of the totally submerged or sub-littoral seaweeds is more difficult. Aerial photographs are useful only to give a preliminary, and largely indirect indication of the presence or absence of weed in the sub-littoral zone, and even for this limited use considerable experience is necessary before the results can be interpreted with confidence. The "View Box—Spring Grab" technique (Walker, *J. Ecol.* 1947, 35, 166), though somewhat laborious and time consuming, gives all the information required with a reasonable degree of accuracy. This method, which is applied after an area has been selected from a study of Admiralty charts, aerial photographs, and the general nature of the coastline, consists briefly of first observing the seabed through a view box fitted to the side of a boat to obtain an indication of whether or not a quantitative assessment would be worth while.

90,000 Acres Surveyed

It has since been found that sampling along transects at measured depths can be replaced by random sampling with little if any, loss of accuracy, and a considerable time saving. A specially designed spring grab which closes automatically by a trip mechanism as soon as it hits the seabed and collects all the weed growing within the $\frac{1}{4}$ sq. yd. which it covers, is used in the sampling operations.

During the past two years, the original technique has been applied to a survey of sub-littoral seaweeds growing in Orkney waters. Of the 180,000 acres of seabed between 0 and 10 fathoms around the Islands of Orkney, 90,000 acres were originally estimated to be worthy of consideration as potential sub-littoral seaweed beds. Of this 90,000 acres, preliminary surveys eliminated 50,000 acres as unworthy of more detailed survey or too dangerous for the application of the "View Box—Spring Grab" technique. The remaining 40,000 acres have been surveyed in detail using a motor boat and a crew of three.

From the results of this survey, it has been possible to estimate that the sub-littoral seaweed resources of Orkney in areas where harvesting would be profitable, amount to 1.2 million tons, growing at a density of 20 tons/acre, mainly between 1 and 6 fathoms.

Large quantities of sub-littoral seaweeds are dislodged from the seabed by winter storms and cast on to the beaches

each year. Two factors must be taken into account in any scheme to utilise this weed. First, if it is not removed quickly, there is a considerable risk of its being reclaimed by the tide; and second, if left in the "packed" state in which it has been cast, it is susceptible to bacterial attack. If economic means of overcoming these difficulties can be devised, cast weed would undoubtedly form a very valuable source of raw material.

Partly for this reason, and partly to obtain information on the location of sub-littoral seaweed beds, about 30 beaches in Scotland and the Outer Hebrides were kept under observation during the winters of 1945-46 and 1946-47. During each of these two winters about 100,000 tons of seaweed were cast, but little is yet known about the conditions of "casting." This is a profitable subject for further investigation.

Suitable methods for the routine estimation of the main organic constituents of the common Scottish brown seaweeds have been developed (Cameron, Ross and Percival, *J.S.C.I.*, 1948, 67, 161-164, and Percival, Ross, *ibid.*, 420). Two methods have been developed for the quantitative estimation of mannitol, the first based on the quantitative extraction by a suitable solvent such as *n*-butanol, and the second involving the use of periodic acid.

The extraction method is, however, unsuitable for routine analysis since at least four extractions of 10-12 hours are necessary. The periodic method is based on the fact that 92 per cent of the mannitol is oxidised in 60 seconds, while the other oxidisable constituents are unaffected.

Separating Alginic Acid

The estimation of alginic acid is based on the extraction of the acid from the seaweed with sodium carbonate solution, the seaweed having been previously treated with dilute mineral acid. The sodium alginate so obtained is then converted into calcium alginate, followed by acidification to give the free acid, which is estimated by determining the amount of acetic acid liberated from a calcium acetate solution.

Laminarin is hydrolysed to glucose, which is then estimated with the Shaffer-Somogyi reagent.

Fucoidin is estimated by hydrolysis to fucose, which is oxidised by periodate, and the liberated acetaldehyde determined by the method of Nicolet and Shinn.

Using these methods the chemical composition and variations in composition with age, season, and depth of immersion of some of the sub-littoral seaweeds common in Scotland have been determined

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(Black, J.S.C.I., 1948, 67, 165-176). Monthly samples of *Laminaria Cloustoni*, *L. digitata*, *L. saccharina*, and *Sacchoriza bulbosa* have been collected for a period of two years, the plants divided into stipe and frond and analysed separately for total ash, organic nitrogen, iodine, mannitol, laminarin and alginic acid. The results indicate wide seasonal variations in composition which are due almost entirely to variations in the composition of the fronds.

The seasonal variation of the above constituents in the common littoral seaweed *Ascophyllum nodosum* over a period of two years, has also been studied (Black, J.S.C.I., 1948, 67, 355-357).

Algal celluloses have been prepared from *Laminaria Cloustoni*, *L. Digitata*, and *Fucus vesiculosus* and have been shown to be fundamentally similar to the cellulose of the land plants (Percival and Ross, *Nature*, 1948, 162, 895).

In the extraction of alginic acid on a commercial scale, the remaining organic constituents of the weed are being wasted. This means that for every ton of alginic acid produced approximately three tons of potentially useful chemicals are at present being lost. Processes for the extraction of these chemicals are being investigated.

Cutting Methods

In the first attempt to harvest sub-littoral seaweed mechanically (Mackenzie, *The Engineer*, 1947, October 10, 17, 24), the weed was cut by rotating cutters driven by under-water oil motors. The

More difficult but offering heavier returns is the cutting and raising of the sub-littoral weed from small craft such as this, a technique which must still be improved if continuing supplies are to be provided for large industries. (The illustrations of this article come from the Central Office of Information film No. 36 "This is Britain")

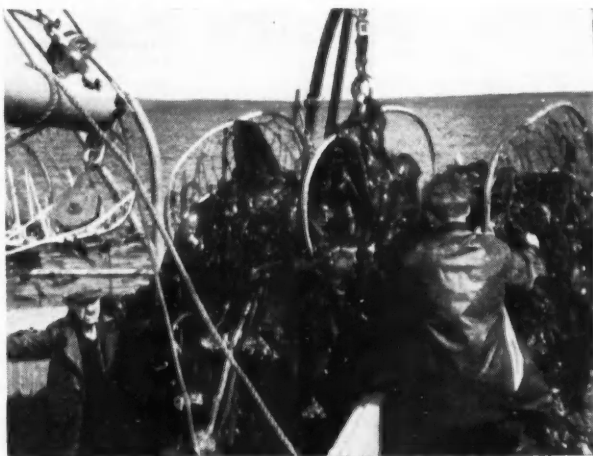
cut weed was entrained in water pumped from the vicinity of the cutters to conveyors on the deck of the surface craft, the water then being returned to the sea and the weed conveyed to the hold tanks.

Examination of the system has revealed serious faults which must be investigated before this principle can be developed as a practicable method of harvesting sub-littoral seaweed.

Grapnel and Winch

The use of specially designed grapnels for harvesting sub-littoral seaweed from motor boats has been developed with the primary object of providing a simple method requiring inexpensive equipment for use by crofters and fishermen in part-time employment. In trials using a single grapnel and hand operated winch, a rate of over one ton an hour has been achieved, which brings the method within reasonable reach of commercial exploitation. Experiments to date have indicated that the weight of weed harvested in a given time increases, although at a diminishing rate, with the size of grapnel, the latter being limited only by the maximum weight that can be conveniently handled.

Further improvement is anticipated from tests at present being conducted with grapnels of a modified form which will traverse a track of greater breadth on the seabed. In actual harvesting operations two or more grapnels with power operated winches would be used and the weight of weed collected correspondingly increased.



Spanish Use of Seaweeds

Limited Employment of Rich Growths

IN Spain, as in other maritime countries, increasing attention is being directed to the industrial possibilities of the extensive banks of seaweed along various parts of the coast. F. Cabrera Gomez has recently described the different species that are most plentiful, in connection with a fairly comprehensive literature review of seaweed research to date. (ION, 1948, pp. 709-718).

There are several species of both the Fucaeae and Laminaraceae families, the former including *F. vesiculosus*, *F. platycarpus*, and *F. serratus*; also to a less extent *F. nodosus*. Among the principal Spanish Laminaraceae are *L. flexicaulis*, *L. cloustonii*, and *L. saccharina*, with one or two others. The botanical characters of both families are briefly noted.

Seaweed in Spain, as elsewhere, has for a long time been used as manure, and on a small scale for other purposes. Work in other countries in this field, including more particularly in that of alginic acid, is reviewed. The author describes his method for obtaining alginic acid which appears to follow the usual lines: the dry

powdered material is several times extracted in weak acid baths, yielding a mixture of alginic acid and cellulose, which is neutralised, washed, and filtered and possibly carbon bleached. The algin or alginic acid is precipitated by hydrochloric and phosphoric acids, and the precipitate dried *in vacuo*.

The properties and numerous industrial applications of the acid and its salts are described with reference to the literature, including the detailed table of Chamberlain and co-workers for alginic acid and its various Ca, Al, Cr, and Be salts.

Some account is also given of the so-called dead algae of which there are large deposits along the Spanish coasts. These, too, have long been used as a source of fertiliser, both in the north and on the eastern coast. In Galicia it is said that some 100,000 tons are collected annually for the purpose. This presumably refers to wet weight. Near Denia, on the east coast, are very considerable banks, more than 100 metres long and two metres or more thick.

COMBUSTION OF COLLOIDAL POWDERS

(Continued from page 346)

the gas pressure, but not on temperature.

This may be simply explained by realising that the gas, owing to continuous emission, does not actually contact the powder. For example, a powder emitting gas at 2500°C. and burning under constant pressure of 1000 kg./cm.², would not show change in the rate of combustion if the hot gases were replaced by an inert gas, such as nitrogen, at ordinary temperature but under the same constant pressure.

Briefly, the method of test used and already described (*loc. cit.* 476) was as follows: A cylindrical sample (strand) of powder was placed vertically in a large steel container filled with nitrogen under pressure, provided with a mirror sufficiently robust to withstand pressures up to 50 kg./cm.². The top part of the powder strand was fired by a wire electrically heated. The combustion zone was displaced from above downwards, and propagation was observed in the mirror, the time of traverse being noted for distances of 5 cm.

Pressures were 10-20 and 50 kg. Velo-

city with the latter pressure agreed well with that deduced from firings under 2000 kg./cm.², using the formula: $V = a + bP$. With a pressure of 10 kg., the observed velocity was definitely less than that calculated, but analysis revealed the presence of a substantial amount of NO in the gases. Visual observation also showed that luminosity in the combustion zone was much greater with 50 kg. pressure than with 10 kg.

The author finally describes and discusses the use of his method in the U.S.A., e.g., by B. L. Crawford and co-workers (*Analyt. Chem.*, 1947, 19, 630-633). Quoting their results, he says it is of interest to compare their velocities with those calculated from the explosion temperature using the formula already given by

$$\text{Muraour: } \log V = 1.37 + 0.27 \frac{T}{1000}$$

under a constant pressure of 1000 kg., giving a speed of 273 mm./sec. or 136.5 mm. for one face. In the French experiments, the value of a is between 8 and 11 mm./sec. Applying these values, the same result was obtained for pressures of 1000 kg./cm.².

SYNTHETIC TANNING MATERIALS

Their Use in Light and Heavy Leather Manufacture

From A CORRESPONDENT

SHORTAGE of domestic tanning materials and the increasing cost of imported natural tannins from the Argentine and Uruguay, South Africa, Turkey, Borneo and India, have forced manufacturers to give increasing attention to the claims of synthetic tanning agents derived from indigenous raw materials. The so-called "syntans" or salts of condensation products, such as naphthalene or phenol formaldehyde, are widely employed as partial tanning ingredients, mordants or bleaches.

The use of these materials has increased, and in addition many newcomers continue to find application in both light and heavy leather tanning. Prominent among the more recent synthetic tanning agents are the melamine formaldehyde resins, which make possible the production of perfectly white leathers that are white all the way through and will not darken with age or exposure to sunlight.

Melamine tannage combines the best features of chrome and vegetable tanning and produces leathers that are highly resistant to heat and oxidation, while possessing improved fullness, texture and wearing qualities. In addition, melamine soluble resins may be used in combination with natural tannins or chrome tannage to impart increased fullness and abrasion resistance and to improve the colour.

Glyoxal

Dialdehyde-resin tannages are new developments derived largely from the research work by A. H. Winheim and E. E. Doherty after the war. These synthetic tannages are based on a new concept which involves the formation of a "reactive leather" which is subsequently chemically bound to resin formers. Many bi-functional compounds have been employed as initial tanning agents, but the principal development work has been done with glyoxal, the most satisfactory pre-tanning occurring in the pH range of 6.5 to 7.0.

The second step in the new process involves the introduction of monomers and prepolymers, followed by slow, controlled polymerisation. Ureas, thioureas, phenols and resorcinols have all been tried out quite successfully in conjunction with aldehydes. Blocking agents, or modifiers

such as the primary, alkylated amines and certain sulphonyl chlorides, sulphonamides, and quinolinates, are all capable of modifying or altering the properties of the tanned leather.

Advantages claimed for dialdehyde-resin leathers can be summarised as follows:—(1) Improved resistance to repeated wetting and drying and therefore greater suitability for use in the shoe industry for both upper work and soles. (2) Improved resistance to perspiration, which qualifies the leather for high grade gloving and clothing. (3) Improved resistance to mild alkalis, and the ability to withstand repeated wetting and drying without deterioration means that dialdehyde-resin leathers compete in some measure with chamois leather.

Bulk Applications

The development of the dialdehyde-resin tannage from the advanced laboratory stage to large-scale factory practice depends largely on the availability of dialdehydes at economic prices. Glyoxal, the simplest of them, is not a cheap chemical and so far has not found what might be termed bulk applications in industry.

In mineral tanning, a good deal of attention has been given to the investigation of alternative tannages to chrome. Iron tanning has, of course, been studied for many years without any outstanding success. From recent research work carried out by T. C. Thorstensen and Ewin R. Theis, of the Lehigh University institute of research, it appears that basic ferric sulphate is superior to other ferric salts, and that sodium glycolate acts in such a way as to give a comparatively stable iron complex resulting in a real iron tannage.

This overcomes the difficulty which has always faced other workers in this field, namely, the apparent impossibility of preventing progressive oxidation of the leather, which is accompanied by a general weakening of the fibres, cracking of the grain and severe discoloration. Ferric sulphate is cheap and very plentiful, and sodium glycolate is in fair supply and reasonably economical to use in the quantities specified.

(continued at foot of next page)

Vegetable Oil Technology

Specialised Institute Established in S. India

THE technical backwardness in the Indian vegetable oil industry and the prospect of surpluses of edible oils if more advanced methods and plant were employed were referred to by Mr. Sitarama Reddi, Minister for Land Revenue, laying the foundation stone recently of the Oil Technology Institute at Anantapur in Madras Province. He indicated that in Madras Province 4 million acres are under groundnut cultivation.

Other important oil resources were copra, cotton seed and castor. It was necessary that there should be an institution which would help to study the various problems relating to the production and processing of oil.

Although at the moment edible oils were mainly retained for food purposes, there was now a good prospect of producing a surplus after meeting the food requirements of India. It would, therefore, be necessary to study in advance the future possibilities of the economic utilisation of these oils in other fields.

It was estimated that Madras Province produces in normal crop years about 250,000 tons of cotton seed annually. If

three-quarters of this was crushed efficiently, it was estimated that about 28,000 tons of oil could be produced annually, in addition to valuable by-products.

The present condition of oil seed milling in Madras was far from efficient. By the introduction of modern methods of oil milling, both the yield and quality of oils from oilseeds would be considerably improved. Taking the examples of groundnut, copra and castor seed milling, if the present quantities of these three oilseeds were crushed by efficient methods, a total quantity of about 52,000 tons more of the oils could be produced. By using solvent extraction methods, a total quantity of about 66,000 tons of these oils, valued at about R. 10 crores, could be produced.

Continuous centrifugal refining resulting in the saving of 15 to 40 per cent of the refining losses involved in the conventional kettle method had materially improved the economics of the refining process. Not a single plant in India was known yet to have adopted this continuous process, which had been in use for nearly 15 years in the U.S.A. The institute is the first of its kind in India.

SYNTHETIC TANNING MATERIALS

(continued from previous page)

Zirconium salts have been used in tanning for several years now, most attention being devoted to zirconium sulphates ranging from acid salts through normal salts to highly basic salts. Tanning with zirconium salts gives a pure white, full leather of considerable toughness, which is held in great esteem for sportswear and bag work.

The technique of tanning with these compounds is simple and the salts reasonably economical in use; moreover, zirconium tanning is becoming increasingly popular. In order to increase the range of salts possessing tanning properties, some of the more complex sulphates which are known to exist in solution are being investigated.

Sodium phosphate and other phosphates are being used as pre-tanning agents, probably the most important being the glassy molecularly dehydrated sodium phosphate known as "Calgon." This possesses the property of combining with hide protein in acid solution, the pre-

tannage being particularly useful when stock is to be completely tanned with vegetable tannins.

Phosphate tannage is essentially a combination between collagen and an acid, and, although phosphate leather is not a commercial product, there is no doubt that phosphates achieve a most useful purpose as pre-tanning agents. They reduce the astringent effect of strong tannin liquors on the grain of the leather, speed up the tanning process, and help to produce a lighter and more even colour.

The shortage of natural tannins has encouraged manufacturers of synthetic tanning agents to make greater use of sulphite cellulose liquor from paper works. This by-product is sometimes added to syntans, in such forms as sulphonated derivatives of phenol or naphthalene formaldehyde condensates. During the war years, the I.G. Farbenindustrie replaced 50 per cent of the total vegetable tanning materials with syntans of the Tanigan series, some of which contained appreciable quantities of sulphited cellulose liquor.

PROGRESS IN POLAROGRAPHY

Increasing Uses in Modern Chemistry

THE polarograph has many and diverse uses and is fast becoming an indispensable instrument in modern chemistry. It would be difficult to list the many applications of the polarographic method since they are continually being extended by the ingenuity of users.

It has, however, already established for itself a unique reputation for rapid and accurate analysis in such varied fields as metallurgy, pharmacology, plastics and medicine.

In view of the increasing attention being paid to this subject the following abstracts from "Polarography," a booklet just issued by Tinsley (Industrial Instruments), Ltd., London, are of considerable interest.

Polarography is an instrumental technique for rapid and accurate analysis, developed by Prof. Heyrovsky, of Charles University, Prague.

It is based on the interpretation of current voltage curves obtained by electrolysis of any solution containing electro-reducible or electro-oxidisable substances. The curves are called polarograms, and both the concentration and species of the substance in solution can be directly determined from the characteristics of these curves.

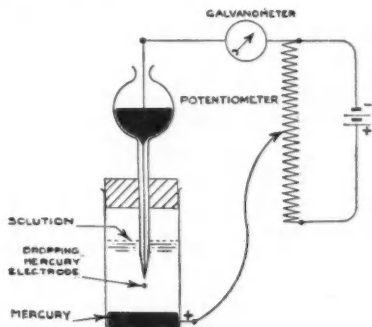
Mercury Cathode and Anode

To obtain a polarogram, the test solution is electrolysed in a particular type of cell known as a "polarographic cell." The cathode of this cell is mercury falling dropwise from a fine bore capillary dipping into the test solution; the anode is a pool of mercury at the bottom of the cell.

A steadily increasing negative voltage is applied to the cathode while the anode remains at constant potential. The current change with increase of voltage does not follow Ohm's Law but rises in a series of steps depending upon the substances present in the test solution.

The current is measured during the electrolysis and is usually recorded, the voltage at which any particular step occurs being clearly indicated on the record.

For the research worker, polarography has added yet another technique in the investigation of fundamental processes. New knowledge has been gained concern-



Courtesy of Tinsley (Industrial Instruments), Ltd.

ing the mechanism of electro-oxidation and reduction and galvanic corrosion.

The sequence of the reactions in organic synthesis can also be shown using the polarograph as an indicator.

The first polarographs were hand operated, the galvanometer current and the potentiometer voltages being plotted manually on graph paper.

Photographic recording of the movement of the galvanometer was the next development. This had the advantage of giving an automatically recorded polarogram, but the high sensitivity required made it necessary to use a galvanometer with a long time constant and therefore heavy damping.

This caused distorted wave forms in many instances and introduced errors which could not easily be detected.

The latest development in recording polarographs has been the application of d.c. amplification to the current passing through the solution in the polarographic cell.

By this means it is possible to use a pen recorder which gives a direct and instantaneous record of the change in current during analysis.

The excursions of the recorder pen are completely undamped, and the exact value of the maximum current at the instant of fall of the mercury drop is shown.

BUDGETARY AND STATISTICAL CONTROL

Factors in Internal Planning in Chemical Plants

by S. HOWARD WITHEY, F.Comm.A.

IN prevalent conditions in chemical industries, a heightened degree of organisation and scientific management in all sections and departments has become essential if the best results are to be obtained. This requires that the operations at each works shall be carefully planned and the most appropriate methods of accounting and costing maintained.

Costs Factor

The earnings reported by some chemical manufacturers during the 1948-49 financial period registered a very welcome recovery, but in some branches of the industry the costs factor tends to be unmanageable. A few companies are faced with financial difficulties, due either to the steep rise in replacement costs or to failure to institute wise directional policies and effective methods of internal check and control.

In the past, some managers and executives have been inclined to regard budgetary and statistical control in the same light as national or government control and as a needless interference which converts business into a kind of mechanical operation. Such viewpoints no longer receive serious support. Personal initiative is not necessarily stifled by the adoption of internal methods to aid departmental control or to indicate in good time the steps which should be taken to cope with new or impending developments.

It is possible to place too much emphasis on certain aspects of industrial planning, but the importance of control is likely to increase rather than diminish during the next few years and co-ordination of different departments in the fulfilment of predetermined plans is incapable of crippling individual performance.

In some instances the plan of operations will cover a definite period—a year or six months—and in addition to the fundamental requirements regarding such things as production, sales and finance, special consideration is given to the nature of the practical work to be undertaken by costing departments in the compilation and classification of labour costs, materials costs, etc., the allocation of operating and overhead expenses and in the treatment of other items which are capable of analysis.

Reports are often needed from depart-

mental managers and shift foremen who have to carry out the firm's general policy, and many managers are now able to draw on facts that very materially facilitate the preparation of daily reports and reliable estimates which can be subdivided geographically or into time periods by reference to specific materials or products.

By planning the volume of production over a definite period and converting the figures into index numbers, some firms are better able to make allowance for all essential factors and to forecast a curve. In some offices budget operations start with a geographical classification of sales, a certain area—such as a county—being taken as the unit and its population and buying power ascertained in order to determine the quota of business it is expected to transact.

Expenditure can generally be classified under the general headings of labour, materials, fixed charges and overhead expenses, and in proportion to the turnover some of these expenses may remain fairly constant; others show very wide variations.

Foremen's Reports

In most instances, it will be convenient to initiate the system of statistical control with the compilation of essential data on the part of the plant foremen, embodying particulars relating to production, consumption of materials and plant performance during each shift. These reports preferably should be designed to enable the data to be recorded in terms with which the foremen are conversant, the quantities of acid used during the shift, for example, being shown in inches as measured from the tanks. All occurrences of which the oncoming foreman should be advised, including any breakdown, will be noted, and the reports should give accurate records of the number of employees at work, the number absent, and the number of units in proper working order.

When the products of one department are the raw materials of another, the transfer of materials within the factory will call for the greatest accuracy in the returns. The sheets relating to the production of mixed acid, for instance, should give the batch numbers, mixer

Each department will be under the control of a manager who will have foremen in charge of each shift and operation, and each shift foreman should be instructed to prepare a daily report. These reports should be collated by the manager at the end of the day and the particulars summarised and forwarded to the statistical office. A typical style of daily report sheet is indicated below:—

The statistical office will act as a clearing house for the works manager and should receive daily reports from the traffic department, giving particulars of all materials received and despatched and information from the laboratory based on the analyses of materials.

Mixed acid is usually prepared by run-

[illegible]

ning the correct quantity of each constituent into a measuring tank and then transferring to the mixer; accordingly the condition of each mixer at the end of each shift should be recorded by the foreman, and the causes of any breakdown noted. The number of men working and absent will be shown in the engineer's report, which will also indicate

whether the progress of maintenance work is satisfactory. In regard to the larger repair jobs, it is advisable to arrange for approximate dates of completion to be given.

The main factors to be considered in the preparation of a production budget are the number of units required, the cost of materials to be used, the amount of direct labour, the indirect labour cost, works burden and overhead charges. These may be collated by means of a number of subsidiary budgets.

Direct Works Expenses

In some large works separate planning statements are prepared for determining the cost of repairs and maintenance, depreciation, power, heating, supervision, etc., and in research and general laboratory work the charge for salaries and wages is often debited to the production departments on a percentage basis, varying in ratio according to the number of hours spent by the officials in each department. Direct works expenses can usually be allocated by the engineers, the wages department and the general stores, while indirect expenses may be debited in the same proportions as the net amounts for a given period bear to the total.

Some firms engaged in the manufacture of several products receive certain materials in rough bulk lots and the material has to be loaded on barrows, wheeled to a hopper and broken into small particles in grinding machines before being mixed with other raw material or stored in bulk, and when large quantities of materials have to be purchased and unloaded in the open for transfer to storerooms located in the process building the material should be carefully weighed before being passed into process. It is a good plan to use bins of the same size to enable the quantities on hand to be readily determined at any time. That policy facilitates easy checking of foremen's daily reports.

The practical utility of budgeting and control by statistical means will depend largely on the methods employed for presenting the data. Experience has proved the advisability of summarising the information in a special book which has been designed to give the daily figures and weekly totals. Such a book should be provided with separate sections for each description of material or constituent, these sections being subdivided to show the weight used, in tons, and the yield, and columns should be ruled for information relating to labour, consumption of power and water, and the number of bags emptied and ready for disposal

Particulars connected with production, labour, and costs, etc., are frequently placed before works managers in the form of charts and this is, on the whole, a simple and a satisfactory method of presenting essential information. Each production chart can be divided into weeks and days to cover a full month's operations, and the systematic recording of each day's production will enable the works manager to see at a glance whether the different departments are contributing their proper quota towards the firm's programme. A good general pattern of production chart is reproduced on the facing page.

By preparing graphs for each final product the process efficiency of each stage can be ascertained and compared week by week. As a rule, a report is sent to the accounting department each month giving quantities of products manufactured and containing the following information as summarised from the daily records:—

- Opening stocks
- Adjustments (surplus or shortage)
- Purchases
- Production
- Transfers from
- Sales
- Used
- Transfers to
- Closing stocks.

Although the audited accounts of many chemical manufacturing and allied companies show that during the past year production costs have been cut, there is little doubt that a wider application of such methods as the progressive assembling of plant and machines, more scientific purchasing of material, improved personnel management and the maintenance of effective systems of internal control would enable the selling prices of some chemical products to be lowered.

Estimating Selling Prices

The majority of producers realise the paramount importance of adopting suitable and uniform methods of ascertaining the cost of each process, operation and contract, and the advisability of compiling accurate statistics on which to base quotations. While the quality of British products is appreciated by overseas buyers, the general level of prices is still too high. Many manufacturers, moreover, are unable to produce in sufficient variety, owing to lack of suitable plant and equipment.

Maintenance and constructional engineers are constantly seeking ways of raising the process efficiency of plants, and profitable attention has lately been

PRODUCTION CHART

[illegible]

given to more economical distribution of power. Production executives have still not generally adopted a practice of estimating production in terms of plant-hour cost, and costing systems must take into account all expenditure on repairs and replacements calculated to prolong the service or useful life of individual units of profit-earning equipment, including the cost of up-to-date attachments and special devices.

Before any true profit can be realised a variety of charges and expenses have to be covered, and when working out the details of a system of control it is very necessary that full consideration should be given to the accounting principles. Jobs should be put in hand as soon as the customers' instructions have been confirmed and, as far as the workshops are concerned, the orders will resolve themselves into so much materials and constituents and so much time spent on processes, operating, grinding, etc.

The term "prime cost" usually signifies the cost of materials, labour, and such direct expenses as foremen's wages, the salaries paid to inspectors and superintendents, the rent of the factory and workshops, the cost of maintaining the plant and equipment to be employed over extended periods, depreciation in the

value of wasting assets. But in order to arrive at the total cost of any job, operation or process, fixed charges of various kinds have usually to be added to the prime cost, including office expenses, selling expenses, travelling expenses, commissions paid to representatives and agents and the salaries paid to engineers, storekeepers, and booking clerks, as well as managers' and directors' remuneration and the cost of research and laboratory work.

Large items in the cost statistics will come under the headings of process labour, operating labour and grinding labour, and the method of organisation and control is facilitated by appropriate methods of recording the wages paid out.

Workers who are paid at a straight hourly rate are often provided with a card on which to enter details of the work performed on each day of the week, these cards being initialed by the foreman or charge hand, whose records are passed on daily to the office for comparison and for preparation of the wages sheets. Particulars shown on the wages sheets include the number and name of each worker; the number of hours worked each day; the total hours worked during the week; the rate of pay; gross wages; the various stoppages and deductions, and the net

Bench Fires in Chemical Laboratories

Report on Cambridge Investigation

DETAILED investigations into the type of fire most likely to be encountered in a chemical laboratory were recently carried out at Cambridge University.

The general incidence of such fires is fairly high, but in most cases they are dealt with by the chemist in charge, the public fire brigade only being called upon when they get out of hand.

Bench fires involving inflammable liquids and/or gases were found to be the most common type, and carbon tetrachloride the most efficient extinguishing medium. These are some of the conclusions published in the report by Chief Officer T. Knowles (Cambridgeshire Fire Brigade) and Mr. A. R. Gibson, M.A., superintendent of the university's chemical laboratories (*Fire Protection and Accident Prevention Review*, 9, 393, September 1949).

Gaseous fires are comparatively rare, but gaseous explosions are not, and these frequently lead to fires.

In dealing with the theory and practice of methods of extinction, the investigators discuss the merits of various media and describe some appliances used. It is pointed out that the Fire Officers' Committee has not approved the use of methyl bromide for general purposes, but there is no serious objection to its use in laboratories in conjunction with other types of extinguishers.

Fifteen practical experiments were carried out using the various extinguishing media, close attention being paid to the time required for complete extinction, and the conclusions reached are that:

BUDGETARY AND STATISTICAL CONTROL

(continued from previous page)

sum payable, and these particulars should correspond with the daily time sheets kept by the foreman, charge hand, or works clerk.

At the present time there are numerous schemes in operation to secure the co-operation of the workers and at the same time reduce costs of production. The percentage addition to wages should therefore bear some relation to increased process efficiency.

Carbon dioxide, although a clean, efficient medium for fires contained in vessels into which the gas can be discharged, and by reason of its greater weight will remain, is not wholly effective for controlling fires involving spilt liquids burning on the surface of a bench.

Methyl bromide is expensive, has greater toxicity than carbon tetrachloride and has the great disadvantage of being a gas at normal temperature and pressure with the result that it behaves somewhat like carbon dioxide in that for surface fires it is difficult to blanket the fire completely. The extinguisher, too, has to be recharged at the factory.

Carbon Tetrachloride

Foam, either chemical or mechanical, although quite effective, causes much mess and is likely to disorganise work for some little time after. Foam could be regarded as supplementary to carbon tetrachloride in cases where the fire assumes large proportions but in these cases the fire brigade is likely to be in attendance.

As a result of the experiments Chief Officer Knowles and Mr. Gibson make the following recommendations.

For immediate first-aid use, the 1 quart size of carbon tetrachloride of the pressure-operated type appears to be the most effective weapon, and it is suggested that these should be provided one to each pair of benches in the large laboratories and one to each small research laboratory. To back up these small extinguishers, appliances of 2 gal. capacity should be allocated. These, it is suggested, should number about 25 per cent of the smaller type installed.

These 2-gal. appliances might well consist of the pressure-operated type with gas cartridge, but filled with carbon tetrachloride instead of water, as during the tests it was quite evident that manually-operated hand pumps were difficult to control, especially if handled by only one man. In this event care should be taken to see (1) that a nozzle giving a straight jet only is used and not a variable nozzle, and (2) that the directions printed on a transfer attached to the gas cartridge do not ultimately slide off after long immersion in the carbon tetrachloride with the possibility of clogging the discharge tube or nozzle.

CHANGES IN GERMAN CHEMICAL POLICY

Reduced Demands Bring Intensive Competition

WEST German authorities are now preparing the ground for industrial programmes for the rest of this year and the early part of 1950.

While coal production is continuing to increase—the daily average in July was 1400 tons above the target of 335,000 tons—there has been rather less demand for coal from industries, including heavy chemicals producers who, according to the mid-year report of the Economic Department of the bizonal Executive Committee, may not draw their full quota. The supply position for iron and steel has so improved that control regulations are often ignored now without any detriment to essential consumers.

So equally has the output of primary aluminium, electrolytic copper and crude spelter increased during the first half of 1949 that consumers are moderating their applications for forward delivery. Marketing difficulties have resulted in a sharp contraction in the production of secondary aluminium alloys.

In chemical industry, the Economic Department reports, the production of calcium carbide has nearly been doubled since the beginning of the year and the manufacture of soap increased by two-thirds. The output of nitrogenous fertilisers and potash salts also increased, but production figures for sulphuric acid and coal-tar dyes were slightly reduced and those for plastics considerably down on the early months of 1949.

Planning Production

Chemical fertiliser prices for the agricultural year which began in July have been held at the 1948/49 levels, at a cost to the public authorities and the taxpayer for subsidies of Dm. 105 million (about £8 million). The production plan for 1949/50 covers all three zones of Western Germany, the French as well as the Anglo-U.S. zones, and provides for 400,000 tons of N, 260,000 tons of P_2O_5 , 610,000 tons of K_2O and 1.5 million tons of lime. The figures can be related with sales in the Anglo-U.S. zones alone during 1948/49 of 310,000 tons of N, 356,000 tons of P_2O_5 , 499,000 tons of K_2O and 1.2 million tons of lime.

Burbach Kaliwerke A.G., one of the three leading potash producers in Western Germany, reports that its production has risen from 44,500 tons of K_2O in 1946

to 90,000 tons annually and, when the Niedersachsen-Riedel group has been extended, will reach 120,000 tons. The project of resuming production in the Königshall-Hindenburg group has been advanced as far as possible, but financial difficulties have compelled the company to curtail its reconstruction.

Trade negotiations are in progress with a number of countries, including Switzerland, Austria, Holland, and Yugoslavia. These supplement the substantial new business arranged with Turkey and Eire. Before July 1950, Western Germany is to supply £37,500 of potash salts, £37,500 of dyestuffs, colours and paints, and £25,000 of industrial chemicals to Eire.

Influx of Refugees

Novel pharmaceuticals and plastics and the chemical utilisation of indigenous raw materials are mentioned as providing opportunities for new industries in Schleswig-Holstein, Germany's most northerly State, which has admitted a very large number of refugees from the East and is therefore in special need of developing fresh avenues of employment. Of 70 firms manufacturing chemicals in the area about one-quarter has been set up by refugees from the East. The four biggest undertakings are the fertiliser works at Rendsburg, the Kali-Chemie A.G. factory at Brunsbüttelkoog, the match factory at Lauenburg and the Nordmark pharmaceutical works at Uetersen.

Many of the firms set up since the war have found it impossible to cope with competitive conditions since the currency reform, and some have had to close down.

In the extreme South-West of Germany, in Baden, chemical manufacturers also report that sales are declining and competition is growing more severe; they complain that chemical manufacturers in the Anglo-U.S. zones are receiving more favourable treatment, as regards import permits and currency allocations.

Soap manufacturers complain that, by buying large quantities of raw materials at high prices and prohibiting further imports at the lower prices ruling now, JEIA has made it impossible for them to lower their prices. Present stocks of oleaginous raw materials are said to be sufficient for about twelve months.

German Appeal for Chemical Expansion

Some Industrialists' Views on Dismantling and Research

IN the first issue (No. 1, July 1949) of *Chemische Industrie*—revived after suspension lasting since 1945—the president of the *Arbeitsgemeinschaft Chemische Industrie* (W. A. Menne) discusses some of the difficulties of German production, including particularly those arising from dismantling and prohibitions imposed in respect to the Fischer-Tropsch processes.

He argues that there are numerous problems which, according to whether they are well or ill handled, will promote or hinder the smooth co-operative working of such a highly diversified group as the chemical industry—and may even entirely disrupt it. The difficulties, he says, will persist so long as the present deplorable division into east and west zones remains, coupled with an inflexible dismantling policy and drastic restraint in certain directions.

Plants and Processes

Claimed to be needed are more precise definition of what is implied in the Fischer-Tropsch plants and processes, and the liberation of those parts which do not essentially belong. According to the German view, it is contrary to economic reasoning to include in these restraints the production of primary products, i.e., synthesis gases, and plant for working up primary products, such as distillation, cracking, and refining plant, states the article in *Chemische Industrie*. There is, moreover, a series of related and auxiliary plants and processes that could be linked up with them.

Because dismantling proposals cover far too comprehensive a field of chemical activity, German industry, says W. A. Menne, is excluded from the entire scope of catalysis with its manifold possibilities, some yet scarcely fully appreciated. It is precisely in this field that German chemists claim to have been among the leading pioneers, and the F.T. process is being adapted in many parts of the world, notably in Allied countries; also a Buna plant is being erected in India.

The terms of the Washington agreement in this respect are, therefore, the more cnerous to Germany, and much is made of the fact that other countries, including Japan, are given free access and even encouragement. These restrictions, writes W. A. Menne, may indeed upset the whole balance and structure of German economic

life, including the growth of export trade, which is among the first essentials of sound recovery.

While Germany has to recover as much of her export trade as possible, the required increase in the chemical section in 1952-3 to twice or three times that of the estimated total for 1949 does not represent a realistic view of the position. The writer proceeds to discuss in some detail the possibilities, and also potential disappointments, of ERP policy as it affects Germany. He concludes with a warning against unwarranted optimism about recovery, and reaffirms his faith in German capability to overcome present difficulties and recover her accustomed place in the economic community.

Prof. Dr. Otto Bayer, of Leverkusen, writes on the fostering of research as the life blood of chemical industry. Conditions in Germany, however, are at present abnormal, and research has to be viewed also from an unusual point of view, says Prof. Bayer, who surveys the present position of university students in comparison with that of other countries. The number of students per 10,000 population in Germany in 1925 was 15, and in 1948, 16.

In the U.S.A. it increased from 45 in 1930 to 179 in 1945; and in Russia from 15 in 1922 to 43 in 1947. In England it was 17 in 1945, the lowest of any except Germany in recent years. It seems, however, that an accurate definition of what comprises a student is necessary before these figures could be taken as a fair comparison.

Future Outlook

Many other difficulties are noted, and Prof. Bayer takes a pessimistic view of the prospects. He dwells at some length on the very different picture presented by the U.S.A., and recalls that most of the really fundamental creative ideas have come from Europe, especially Germany. Europe, including Germany, must not therefore be allowed to sink.

The writers present, from their point of view, a powerful case, and it is difficult to avoid a certain amount of sympathy. Yet it seems necessary to recall occasionally, without being ungenerous, the fact that Germany lost the war, and to ask whether we should have been better treated had the position been reversed.

FIRE PREVENTION

Some Original Work by DSIR

AN account of the year's progress by the Joint Fire Research Organisation is given in "Fire Research 1948" published this week for the Department of Scientific and Industrial Research by HMSO (post paid 1s. 2d.).

It contains the report of the Fire Research Board and the report of the Director of Fire Research for the year.

Among the original matters raised is an investigation of the possibility of rendering some highly inflammable liquids safe by the use of suitable additives.

It is recalled that the suggestion has been made from time to time that certain chemical fire extinguishing agents of the methyl bromide type could be dissolved in combustible liquids so as to remove completely the fire hazard of stored liquid. It has even been suggested that by choosing an agent of appropriate volatility, the liquids might still be usable in internal combustion engines, though incombustible while in bulk.

Aviation spirit and aviation kerosene were chosen for experiment as likely to present the greatest practical difficulties. The results showed the method is not practicable with spirit, using the inhibitors at present available. With kerosene its practicability is doubtful.

Considerable interest has been shown in the use of wetting agents for fire fighting. Preliminary experiments have indicated the range of special applications in which they are worth considering; they do not appear to offer any spectacular advantage in general fire fighting.

An interesting conclusion from the examination of a sample of a pre-war foam compound, intended for suppressing oil fires, which had been stored in a hot climate (Singapore) was that there had been no appreciable deterioration of either foam production or heat resistance.

Building Research in Scotland

The Building Research Station's Scottish laboratory at Thorntonhall, near Glasgow, is now partly completed and a nucleus of staff has begun work there. To introduce the new laboratory a one-day conference is to be held in the Rankine Hall, Glasgow, on Thursday, October 6. Lord Morrison, Parliamentary Secretary, Ministry of Works, will preside, and at the afternoon session the chair will be taken by Mr. W. K. Wallace, chairman of the Building Research Board, DSIR.

TAR SURFACINGS

Technical Study of Oxidation Effects

RESEARCH with the object of improving the durability of tar surfacings is being carried out at the Road Research Laboratory, DSIR, and the first stage of the work is described in "Road Research Technical Paper No. 16—The Reaction of Oxygen with Tar Oils," now published by HMSO (post paid 11d.).

Prolonged exposure to weather affects the properties of all bituminous road-making materials, until eventually the tar becomes brittle at low atmospheric temperatures. In that condition the tar bond is broken by the action of traffic, stones break away from the surface and disintegration begins. The effects are more pronounced in those types of road material in which a relatively thin film of binder on the surface of each stone is exposed directly to the atmosphere. This applies particularly to medium and open-textured carpets.

The Road Research Laboratory has been studying the causes of weathering in tar and has established that the most important agent is the oxygen in the atmosphere acting chemically upon the constituents of the tar. This has led to a detailed examination of the reaction of oxygen with the tar and the results of the first stage of the work, the oxidation of the oily constituents of the material, are described in Paper No. 16. Results from this investigation are being applied to a study of the whole tar.

This first report is necessarily inconclusive and is concerned very largely with methods of test and general procedure.

The immediate objectives of the work are to develop laboratory tests for assessing the susceptibilities of road tars to oxidation and to evolve methods of improving tars of low durability. The work is part of a programme of research undertaken in co-operation with the British Road Tar Association on the advice of the joint Tar Research Committee.

More Coal Raised

Britain's total output of coal last week was 434,700 tons more than in the previous week, when labour troubles caused a lessening of production. Comparative figures are:— Last week: 4,201,300 tons (deep-mined 3,932,700 tons, opencast 268,600 tons). Previous week: 3,766,600 tons (deep-mined 3,504,900 tons, opencast 261,700 tons).

PACKAGING STANDARDS

BSI Code for Industry

THE Packaging Code (BS 1133), originally prepared in 1943 by the British Standards Institution to satisfy an urgent war-time need, has now been issued in a completely revised and extended form. The compilation was by a BSI committee representative of 24 trade and scientific bodies, a number of large trading concerns, and government departments.

Considerable structural and textual changes have been made to the code to suit present needs, particular emphasis having been given to the packaging of the products of industry for home and overseas distribution. The work has been deemed too large to issue, or even compile, as one complete entity. It is therefore being published as 17 sections.

The first three sections are grouped together as the "Introduction to Packaging," in which the principles governing design, construction, and materials are outlined. Five other sections are also available in completed or provisional form, viz: wooden containers; textile bags, sacks and wrappings; packaging felt; adhesive closing and sealing tapes; tensional steel strapping.

Four more sections are in an advanced state of preparation and are expected to be issued in the near future. These deal variously with mechanical handling of containers, corrosion, paper, and wicker and veneer containers. The few remaining sections will deal with such subjects as protection against pest and mycological attack, and metal containers.

The section of the code devoted to textile bags, sacks and wrappings, which is obtainable from the British Standards Institution, 24/28, Victoria Street, London, S.W.1, at 8s. net, postage paid, gives detailed information on the most suitable materials for the packaging of particular industrial products, also methods of closing the sacks and other containers. It contains a number of pictures illustrative of materials and methods of packaging, and lays down rules for the safe and convenient stacking and storing of packages of varying sizes and shapes.

New Address

The registered office and only address of Charles Midgley, Ltd., a subsidiary of Evans Medical Supplies, Ltd. (formerly of City Road, Manchester), is Speke, Liverpool 19; telephone Hunt's Cross 1881.

PRICE CHANGES

Zinc Prices Increased

THE price of good ordinary brand zinc was raised last Monday by £2 15s. per ton (delivered), from £63 10s. to £66 5s.

This was stated by the Ministry of Supply to be due to the rise in the price of zinc on the American market.

As a result, a corresponding advance is notified in the rates for zinc oxide—of £2 6s. 6d. per ton for lots of not less than two tons delivered buyers' premises. Red seal rises from £63 10s. to £65 16s. 6d., green seal from £65 to £67 6s. 6d., and white seal from £66 to £68 6s. 6d.

Vegetable Oils Cheaper

THE Ministry of Food announces that during the 4-week period ending October 1 the following reductions in the prices of unrefined oils will take effect:—

Linseed oil from £138 to £126 per ton naked ex works.

Linseed oil foots from £88 to £76 per ton naked ex works.

Castor oil first from £110 to £98 per ton naked ex works.

Castor oil seconds from £103 to £91 per ton naked ex works.

Rapeseed oil (Chinese) from £170 to £130 per ton naked ex works

Rapeseed oil (other) from £180 to £140 per ton naked ex works.

The prices of all other unrefined oils and fats, and technical animal fats allocated to primary wholesalers and large trade users will remain unchanged.

German Plant Available

THE United Kingdom is bidding for some of the plant about to be allocated between the member nations of the Inter-Allied Reparations Agency.

Included in the list of equipment available is plant from the I.G. Farben Leverkusen (serial B/S/133). For the section for the production of polyamides and miscellaneous resins, application should be made to the Board of Trade, RMD, RM5A, I.C. House, Millbank, S.W.1. Another section for the production of hydrazine hydrate is the concern of the Ministry of Supply (G.5e), Shell Mex House, Strand, W.C.2

This is the final invitation for applications, which should be made by September 15.

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The Chemist's Bookshelf

A NEW DICTIONARY OF CHEMISTRY—(2nd Edition). Edited by Stephen Miall and L. Mackenzie Miall. 1949. London: Longmans, Green & Co. Pp. 589. 60s. net.

The first edition of this dictionary was published in 1940, but unfortunately all the existing stocks were destroyed in the raid on the City of London in December of that year when Paternoster Row was burnt down. War difficulties and other problems have prevented a new edition appearing until now. The dictionary remains the same in its general character and design, and supplies the need of a compact work of reference not only for chemists, but others who need accurate information on chemical matters. The work is in fact a miniature encyclopaedia containing not only explanations of terms used in chemistry and chemical engineering, accounts of chemical substances and chemical operations, drugs, vitamins and biochemical subjects but also biographical notes about individuals of historical importance. Included are new articles on atomic energy and the sulphonamide group of drugs. A number of new biographies has also been added. There is a valuable table of physical constants of some 1800 organic compounds prepared by Mr. F. G. Crosse.

It is noted with regret that Mr. Stephen Miall died before the completion of the work, but the final revision of proofs, etc., was carried on by his son, Mr. L. Mackenzie Miall.

CONDENSED REVIEW OF PHARMACY (6th edition). George W. Fiero, Ph.D., Ph.D. 1949. New York and London: John Wiley & Sons, Inc., and Chapman & Hall, Ltd. Pp. 121. 18s. net.

A complete condensed compendium of the drugs, chemicals and preparations of the United States Pharmacopoeia (13th revision) and of the National Formulary (8th edition) is supplied in this book. The work, which has been entirely re-written to conform with the English titles used in the USP and NF is divided into five parts: Practical pharmacy; galenic pharmacy; *materia medica*; toxicology

and elementary chemistry. Organic and inorganic chemicals are listed separately, also the common names of official drugs, and there is a comprehensive index.

THE SOILS OF PALESTINE. A. Reifenberg. Revised second edition. London: Thomas Murby & Co. Pp. 174. Plates 18. 16s. net.

The investigation of the properties of the soils of Palestine is a task of primary importance, and the problem of restoring the ancient fertility is one that must be of considerable concern to the Israeli government. The author, who worked on soil problems for 13 years at the Hebrew University, Jerusalem, produced a general survey in 1937, of studies in soil formation and land utilisation in the Mediterranean. In the present revised second edition, translated by C. L. Whittles (soil chemist, West of Scotland Agricultural College), progress in exploration of Palestinian soils in the last ten years is recorded, and a short survey on the Jordan Valley Authority is included. New chapters have been added dealing with soil erosion and the effects of saline irrigation water. A bibliography is given at the end of each chapter, also a number of useful tables and diagrams, a subject and author index, and 18 well-chosen plates.

"BUBBLE flotation" is generally agreed to have been discovered by Alcide Froment in 1903. Since then science has learned much about bulk and selective flotation, aspects of which—modern theories and applications—are illustrated with pictures and descriptions of its own flotation and grinding plant in Bulletin No. F.10, B.29 "Denver Sub-A Flotation," now available from the Denver Equipment Co., Denver, Colorado, and London. This refers also to the laboratory service which is available both for batch and continuous pilot plant tests.

THE 1950 issue of the Scottish Wholesale Druggists' Association catalogue is now being prepared and will be published in December.

CHEMICAL EDUCATION

Autumn Programme in London

A WIDE range of subjects for day and evening classes, part or full time courses, is contained in the prospectus of the Sir John Cass Technical Institute for the 1949-50 session, the first term of which begins on September 26.

The institute is recognised by the University of London for the award of internal degrees in science and metallurgy, and is one of the few centres of higher education in the City of London.

Courses of lectures and practical work in organic and analytical chemistry include: microchemistry; spectroscopy; organic chemistry for post-graduate students; statistical methods in scientific and industrial research; recent advances in colloid chemistry; chemical plant and processes; German for chemistry students; and petroleum technology.

Varied Studies

Among the lectures to be given during the session are the following:—

"Statistical Methods in Scientific and Industrial Research," by D. R. Read; 24 lectures on Monday evenings at 6.45 p.m., during the first and second terms. First series: Mathematical Statistics, beginning September 26; second series: Design of Experiments, beginning Monday, January 9 1950.

"Recent Developments in the Chemistry of Antibiotics," by F. A. Robinson. Course of eight lectures on Friday evenings, at 6.30 p.m., commencing October 7.

"Microchemical Analysis," by David W. Wilson and F. Holmes. Ten lecture-demonstrations on Thursday evenings at 6 p.m., starting January 9 1950.

"Patents and Industrial Design Protection," by Eric Walker. Series of eight lectures on Thursday evenings at 6 p.m., beginning January 26 1950.

Australian Scientific Conference

Tribute to the work of Australian scientists in solving urgent problems associated with agriculture and industry was paid by Prof. T. Wallace, director of Long Ashton Agricultural Research Station, Bristol University, and Dr. James Stewart, of Moredun Institute, Edinburgh, at the conclusion of the British Commonwealth Scientific Conference in Adelaide last week. Further meetings will be held in Canberra to collate results and make recommendations.

NEXT WEEK'S EVENTS

SUNDAY, SEPTEMBER 11

International Fair

Prague: Daily (until September 18).

International Autumn Fair

Vienna: Daily (until September 18).

MONDAY, SEPTEMBER 12

International Fair

Bolzano, Italy: Daily (until September 27).

TUESDAY, SEPTEMBER 13

British Pharmaceutical Conference

Blackpool: 86th meeting (until Friday, September 16). Some 22 papers will be read and discussed during the science sessions.

Incorporated Plant Engineers

Manchester: (East Lancashire Branch) Engineers' Club, Albert Square, 7.15 p.m. "Automatic Boiler Control," by a technical representative of Ronald Trist & Co., Ltd.

Dundee: Mathers Hotel, 7.30 p.m. Talk by members.

WEDNESDAY, SEPTEMBER 14

Institute of Petroleum and Institution of Fire Engineers

London: 26 Portland Place, W.1, 5.30 p.m. J. H. Burgoyne, L. L. Katan, and J. F. Richardson: "Application of Air Foam to Oils Burning in Bulk," and "Uses of Solid Carbon Dioxide to Extinguish Burning Liquids"; E. Thornton: "Some Practical Aspects of the Application of Foam to Large Oil Tanks."

THURSDAY, SEPTEMBER 15

Incorporated Plant Engineers

Liverpool: (Liverpool and North Wales Branch), Radiant House, Bold Street, 7.30 p.m. J. P. Harris: "Use of Steam for the Preserving Industry."

FRIDAY, SEPTEMBER 16-17

Society of Leather Trades' Chemists

Leeds: University, 9.30-12.15 p.m. Reading of papers by P. Danby; R. G. Mitton, and C. C. Posnett. 2 p.m. Paper by J. A. Lovern. 3.15 p.m. Business meeting. 7 p.m. dinner at the refectory: guest of honour, W. R. Atkin. September 17: Papers by W. Siddall and W. M. Ames.

International Autumn Fair

Budapest: Daily (until October 2).

"Open Door" Meetings

In response to repeated requests, the American Association of Consulting and Chemical Engineers, Inc., has decided to adopt a new policy of admitting to its meetings industrialists who are not members of the association.

HOME

Glass Containers Freed

The Board of Trade has made an Order—The Control of Containers and Packaging Order (No. 6) 1949—removing restrictions on the sizes of glass bottles which may be used for packaging of goods for the home market. The order comes into effect on September 12.

Fire at Ciba Laboratories

The works fire brigade at Ciba Laboratories, Ltd., Horsham, recently re-organised, was to be the subject of an experimental "alarm" when a real outbreak intervened. Fire broke out in one of the departments on August 30 and the works brigade dealt with it within a few minutes and had quelled it by the time the Horsham Fire Brigade arrived. Damage was negligible.

Progress at Grangemouth

The I.C.I., Ltd., chemical development at Grangemouth, was considered by the Dean of Guild Court there last week and approval was given to plans for a further extension, costing £370,000, representing the third stage of the £1 million scheme for the factory. Approval was also given to a scheme by Scottish Oils, Ltd., for the housing of workmen in a special camp during the work on the oil refinery development in the area.

Demonstration of New Rum Still

A new continuous rum still was recently demonstrated by the A.P.V. Co., Ltd., at its Point Pleasant Works, to a party of visitors from the Jamaican industry. The main technical features of the still, which has been manufactured for export to British Guiana, include: use of the APV-West high efficiency plate design for the rectifying column, easily cleaned plate used in the analysing column, and the APV paraffin heat exchanger.

Mechanical Seals

Flexibox, Ltd., associate of the M.O.R. Group, announces that its specialised range of mechanical seals for oil refinery and chemical process pumps has been chosen to equip the large petroleum-chemicals plant of Petrochemicals, Ltd. More than 100 Flexibox mechanical seals are used throughout the plant, mainly in centrifugal pumps dealing with naphtha, aromatised product, isopropanol, propylene, acetone and ammonia and in the isopropane agitators.

Chemical Works Visits

Recent visitors to the establishments of Evans Medical Supplies, Ltd., Speke, Liverpool 19, have included parties from the Sheffield branch of the Pharmaceutical Society, the Bolton Pharmaceutical Association, the University Settlement in Liverpool, students from the Liverpool School of Pharmacy, and student nurses from local hospitals.

N. American Exports and Imports

United Kingdom exports to the U.S.A. in July amounted to £3,815,000, 15 per cent more than the average for the second quarter of the year. Re-exports to the U.S.A. were £246,000. Imports from the U.S.A. were £20,534,000. U.K. exports to Canada, £6,686,000, were slightly above the second quarter level. Imports from Canada were £22,365,000.

Microchemists' Meeting

The Microchemistry Group of the Society of Public Analysts and Other Analytical Chemists is holding a conference in Nottingham on September 22. A special luncheon to members of the committee and microchemists attending the conference is being given on Friday, September 23 at the Black Boy Hotel, by L. Oertling, Ltd., manufacturers of microchemical balances.

Slackening of Scottish Paper Trade

Papermaking concerns in Scotland are experiencing difficulties largely due to a decline in home and overseas demand associated with the high price levels dictated by Government buying policy. Several plants have closed down, latest being that of Annandale & Son, Ltd., of Polton. Inveresk Mill, Musselburgh, is working on short time and West of Scotland mills are also known to be finding difficulty in supporting full output.

Chemical Precipitation

The Glasgow Highways Committee is to be asked to effect improvement in sewage disposal treatment in the city by chemical precipitation methods, to collaborate with other areas interested to improve the standard of cleanliness in the Clyde Valley area, and to modernise methods of treatment and layout at various sewage plants. It is considered likely that this will be followed by heightened demand by local authorities for a very much higher standard of recovery from industrial effluents.

THE WEIZMANN INSTITUTE

Scientists to See Progress in Israel

SCIENTISTS and scholars from Britain, America, France, India, Russia and a score of other countries have been invited to Israel for the opening on November 2 1949, of the new Weizmann Institute of Science at Rehovot. The massive building was planned as a birthday gift for Dr. Weizmann on his 75th birthday in 1944. Now, as President of Israel, he will be the guest of honour at the celebrations which will coincide with his 75th anniversary.

The new institute includes branches for isotope research, polymer research, biophysics, applied mathematics and optics, and has cost over £1 million. At the same time the foundation stone will be laid for a new institute of experimental biology and a £4 million endowment fund campaign will be launched to finance present research plans and other schemes.

Science and Industry

Mr. Meyer W. Weisgal, chairman of the institute executive council, described the new building as part of the scientific organisation directly related to the general development of Israel, to the exploration of its natural potential and the qualities of its resources, to the determination of soil processes, of chemical deposits and water content, and to the betterment and broadening of its industrial processes.

The institute, in conjunction with the Palestine Research Association at Harvard University, had for some time been experimenting with processes for de-salting water in the vast Negev desert. They had reached a point where it was possible to supply water fairly economically but not yet for irrigation.

PERSONAL

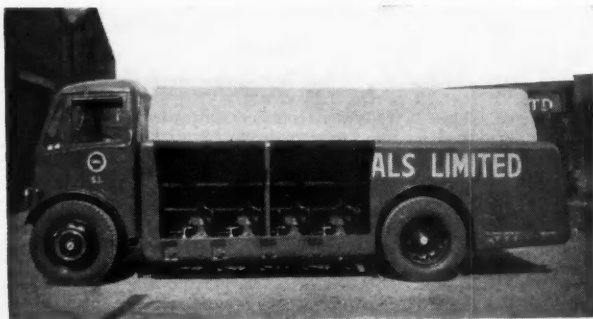
Italian Award to British Scientist

THE "Premio Europeo Cortina" prize of 1 million lira (£500), offered by the city of Cortina d'Ampezzo in conjunction with the Italian review, *Ulisse*, has been awarded to PROF. JOHN READ, professor of chemistry and director of the chemistry research laboratory at the University of St. Andrews. The award is an appreciation of Prof. Read's book, "An Entry to Organic Chemistry," which was judged to be the best popular scientific work published in the last four years. Of the 35 entries, candidates for the Italian award, 11 were British, 15 Italian, five French, two Portuguese, one Dutch, and one Spanish. The British entries were considered outstanding, and the final choice lay between Prof. Read and PROF. O. R. FRISCH, of Trinity College, Cambridge, whose book, "Meet the Atoms," was highly commended.

MR. C. S. TERRY, of the School of Pharmacy at the Royal Technical College, Glasgow, has been awarded the Wellcome Pharmaceutical Research Fellowship by the adjudicating committee. The Fellowship, valued £350, is renewable and Mr. Terry will undertake research on bacteriophages of *Pseudomonas aeruginosa*.

Ostelin Silver Jubilee

Glaxo Laboratories, Ltd., recently celebrated the silver jubilee of Ostelin, the first concentrate of vitamin D preparation to be made available to the medical profession. It was first made in 1924 by Mr. G. P. Dodds, who is still with the Glaxo company.



The latest refinements in chemical distribution equipment are used in the new A.E.C. bulk delivery tankers built for Shell Chemicals, Ltd. That shown here has its panelling raised to reveal the delivery pipelines, each with Brodie-Kent meter, for separate deliveries from the two 500-gal. and two 400-gal. compartments

OVERSEAS

More Isobutyl Alcohol

Celanese Corporation of America has announced that volume production of isobutyl alcohol has begun at the Bishop, Texas, chemical plant. This versatile solvent and intermediate has been somewhat scarce for some time, and it is expected that the additional production will open up new methods of use.

Deep Drilling for Sind Oil

The Burmah Oil Company's test petroleum well at Lakhra in Sind is now 10,000 feet down, but no oil has yet been found. The well will be drilled as deep as possible, possibly to a maximum of 15,000 ft. Production at the BOC well at Chakwal, West Punjab, averaged 370 barrels a day during the week ending August 20.

World Tin Output

World production of tin in concentrates in June rose to 15,600 long tons, an increase of 2800 tons above the total for the previous month, according to advance statistics of the International Tin Study Group. Tin metal production for June was 14,000, a decrease of 700 tons on the May figures. The belief gained ground last week that the control of tin consumption was likely to be dispensed with in the U.S.A.

New Australian Tinplate Mill

A new tinplate mill under erection at Port Kembla, Australia, is expected to compare favourably with any similar plant in the U.S.A. It will have 29½ acres under one roof. The controlling company, Australian Iron and Steel, Ltd., which has ordered the necessary equipment, will use both electrolytic and hot dipping methods of plating, and expects to turn out 120,000 tons of tinplate a year, mainly for Australian consumption.

Dismantling Ruhr Chemie

Violent demonstrations and all the signs of determined resistance, which accompanied the first steps to dismantle the prohibited sections of the Ruhr Chemie works at Oberhausen in the Western zone of Germany, ceased when detachments of the Manchester Regiment took post at the factory this week. The work is now going forward, requiring 90 engineers and others, whose number will need to be increased when dismantling of the principal installations begins.

Coal Saving Plan

To conserve high class metallurgical coal resources and permit the utilisation of high-ash low-grade coals, India's Council of Scientific and Industrial Research has proposed that coal in pulverised form should be used for firing stationary and locomotive boilers.

New South African Nickel Lode?

The nickel bearing ore deposits in the Insizwa Mountains in Pondoland, Eastern Cape Province, are to be exploited by a Johannesburg syndicate. Permission has been obtained from the Minister of Native Affairs to prospect the area, with authority to acquire a lease. Geologists report that the ore also contains platinum, gold, silver and copper.

India's Fertiliser Project

Progress is reported to have been made in the construction of India's long-planned fertiliser factory at Sindri. It is hoped that the pilot plant will begin operation in March 1950, and that full production will be attained before the end of the year. The factory is expected to produce as by-product about 900 tons of calcium carbonate daily which will be used for the manufacture of cement. Proposals are also being considered for the production of 10 tons of urea, eight tons of formaldehyde, and 200-250 tons of soda ash per day.

Isotopes and Ceramics

The first supply of radioactive isotopes for use in ceramic research was recently received at the U.S. Alfred University. The initial task to be undertaken will be that of study of diffusion between metal oxides and ceramic materials. The scheme will, however, be wide enough to allow for research in several other fields according to the *Ceramic Age* (54, 1), two laboratories having been equipped for investigations in biology, chemistry and physics.

\$10 M. Sodium Plant

The National Distillers Chemical Corporation is constructing in Ashtabula, Ohio, a \$10 million plant, with a rated capacity of 100,000 lb. of sodium a day, which will be in production by April 1950. Copies of the booklet are being sent on request by Department A of the Corporation, at 120 Broadway, New York 5, N.Y.

CEYLON'S ILMENITE SANDS

Practical Steps to Exploitation

CEYLON'S valuable mineral sands are to be exploited, and tenders will be sought from manufacturers abroad to start civil engineering operations at the site near Trincomalee, on the east coast of the island. The Government of Ceylon has secured the services of Mr. A. D. Hughes, well known in the ilmenite industry in Travancore, South India.

The rich concentrates of black sands with about 75 per cent ilmenite, 14 per cent rutile and 9 per cent zircon, are found 30 miles north of Trincomalee, over a stretch of five to six miles, extending beyond the low tide mark. This is the principal site, but deposits are also found in other parts.

These sands are said to represent some of the richest ilmenite deposits in any part of the world. In titanium dioxide content they come second only to those of Travancore, which have about 53 per cent, while the Ceylon sands have 50 per cent.

Certain foreign concerns are stated to have offered to exploit Ceylon's mineral sands on a royalty basis, but the Government refused the offers.

FIRST RUBBER FACTORY

FOREIGN capital, chiefly American, will form one-fifth of the Rs.5 million State-sponsored factory in Ceylon for the manufacture of high-grade tyres and other heavy rubber products. The Government will hold 6 per cent cumulative preference shares for another Rs.1 million and the balance of Rs.3 million will be subscribed by private local capital.

The new factory will be the first of its kind in Ceylon to undertake the manufacture of heavy rubber goods, car, lorry and truck tyres.

It will also undertake the production of processed rubber such as Pliofilm, carbon black rubber and other varieties of processed rubber which have a ready market abroad.

This enterprise is also the first in which the Ceylon Government is associated with foreign and local private capital. The foreign investor in the new factory is the General Tyre and Rubber Company of America, which has established similar factories in many countries. The American company will also provide the technical experts.

CRYSTAL COLOURINGS

Italian Studies of Anomalies

IN her paper presented to sections of the Italian Chemical Society Gilda Cavicchi recorded some interesting anomalies in the colouring of mixed crystals, especially cyanides of the platinum metals.

Mixed crystals formed from coloured and colourless salts usually have the same colour as the former, in lighter shade. A special case is that of salts which are coloured only in the solid state, e.g., some platino-cyanides.

Recent research by G. A. Barbieri (Accad. d. Scienze di Bologna, 1948) has shown that the mixed crystals formed of barium platino-cyanide with barium pallado-cyanide—the latter being colourless—have not the yellow colour of the platinum salt, are green and more fluorescent.

Colour Changes

It was thought of interest to study other platino-cyanides in this connection, notably the Mg salt, $\text{MgPt}(\text{CN})_6 \cdot 7\text{H}_2\text{O}$, which has an intense strawberry red colour, with greenish-blue metallic reflections and is not fluorescent either in ultra-violet or X-rays. The MgPd cyanide has been previously described as a non-fluorescent colourless salt, with four molecules of water of crystallisation.

The author has found that crystals of this Mg salt heated to 100°C . lose 4 mol. water; but analysis still corresponds to the formula with 7 mol. water— $\text{MgPd}(\text{CN})_6 \cdot 7\text{H}_2\text{O}$ —similar to that of the Pt salt. This agrees with the result obtained, namely, that this MgPd salt forms mixed crystals in every proportion with MgPt cyanide. Their colouring is anomalous. 1.8 per cent by weight of the Mg palladium cyanide suffices to change the strawberry red colour of the corresponding platinum salt to orange red, and, with further additions, to orange and yellow. The mixed crystals were all more or less fluorescent with X-rays. It would be of interest to supplement these findings with quantitative optical tests. (*La Chim. et l'Ind.*, 1949, 31 (6), 204-5.)

Spectrographic Analysis of Bronze

A new spectrographic method of analysis of bronze alloys has been announced by Dr. Berta and Dr. A. Palisca, of the Fiat Company's research laboratories. Experiments with the use of a courtex-electrode of very pure bismuth are reported to have given good results in determining the percentage of tin, lead, zinc, etc.

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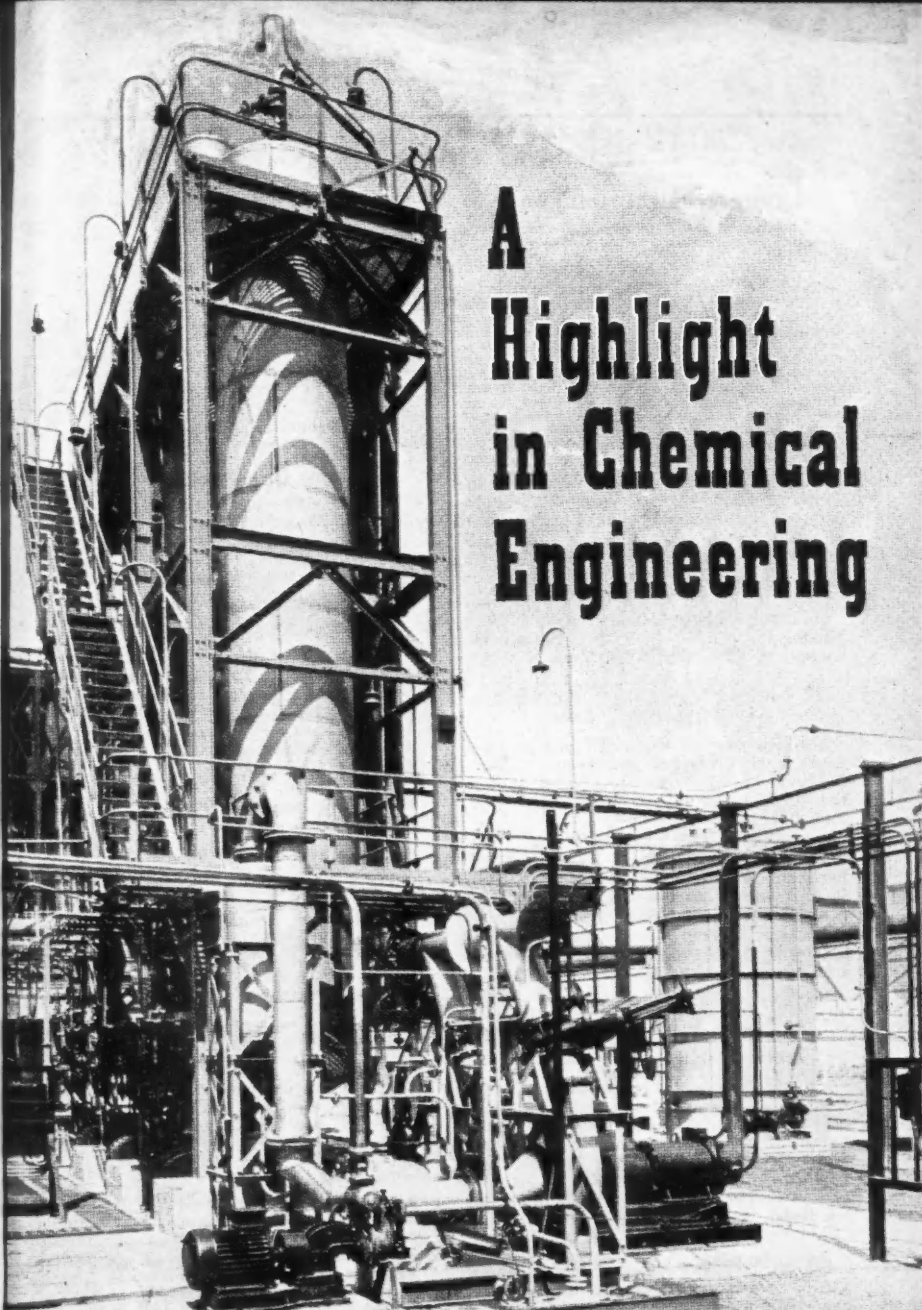
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Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

CHIRNSIDE LIME Co., Newcastle-on-Tyne. (M., 10/9/49.) August 5 debenture, to Olds Discount Co., Ltd., securing all moneys due or to become due to the holders; general charge. *Nil. Dec. 27 1948.

Satisfaction

HAREFIELD LIME Co., LTD., Cowley, Middlesex. (M.S., 10/9/49.) Satisfaction August 8, £396, registered June 6 1941.

Company News

The directors of **BOOTS PURE DRUG Co., LTD.**, have declared an interim ordinary dividend for the half-year ending September 30 of 10 per cent, less tax.

Increases of Capital

The following increases in capital have been announced: **C. C. WAKEFIELD & Co., LTD.**, from £2,234,375 to £3,137,500. **FAIRBANK KIRBY, LTD.**, from £8000 to £12,000. **THOMAS HEDLEY & Co., LTD.**, from £500,000 to £1,000,000. **J. C. GILBERT, LTD.**, from £10,000 to £15,000.

New Registrations

Ashford Paint and Cellulose, Ltd.

Private company. (472,328). Capital, £2900. Manufacturers of and dealers in paints, colours, varnishes, lacquers (transparent or pigmented), cellulose products, and solvents, bituminous paints, etc. Directors: A. O. Hughes, J. E. Hughes and L. G. Palmer. Reg. office: 15 Wellesley Road, Ashford, Kent.

Canadian Waxes, Ltd.

Private company. (472,368). Capital, £1000. Manufacturers, producers, refiners, distillers of petroleum and petroleum

products and oils and oil products, lubricants, motor spirit, tar, bitumen, wax, beeswax and oil fuels. Directors: W. Reucassel, A. P. Glover and F. N. Glover. Solicitors: Beaumont & Sons, 380 Gresham House, E.C.2.

Dextran, Ltd.

Private company. (472,374). Capital, £100. Manufacturers of plasma substitute and biological preparations of all kinds, etc. Directors: T. F. J. Collins, T. C. Usher. Reg. office: Street One, Aycliffe, Darlington.

Kloryde Chemical Company, Ltd.

Private company. (472,221). Capital, £4000. Manufacturers of chemicals, bleaching powders and liquids, etc. Directors: A. Gardner, F. Jackson and Wm. C. Gardner. Reg. Office: Weedon Road, Northampton.

A. C. Post & Company (Cornwall), Ltd.

Private company. (472,326). Capital, £7000. Objects: To acquire the Plymouth branch of the business of agricultural merchants carried on by Gerald Glanville, Ltd., at Lockyer Quay, Sutton Road, Plymouth; manufacturers of artificial manures, manurial products and fertilisers, etc. Directors: A. C. Post, L. J. Post. Reg. office: Pensilva, Liskeard, Cornwall.

Verity Chemical Products, Ltd.

Private company. (472,396). Capital, £300. Manufacturers of bleaching, washing, cleaning, scouring and similar powders and preparations, chemicals. Directors: F. R. Bartlett, J. W. Fisher. Reg. office: c/o Fisher (Portsmouth), Ltd., Haslemere Road, Southsea, Portsmouth.

South African Sea Salts

THE factory designed to produce £500,000 worth of salts and metals from sea water annually has been completed at Jacob's Bay, four miles north of Saldanha Bay, South Africa.

The new plant, the first of its kind in Africa, is financed entirely by South African capital. Its annual production is expected to be 100,000 tons of different grades of salt, 36,000 tons of magnesium which will more than meet South Africa's needs, 700 tons of potassium, and 200 tons of bromine.

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The Stock and Chemical Markets

HOPES of a satisfactory outcome to the Washington talks have maintained firmness in markets, British Funds showing further improvement on balance, and industrials with dollar export prospects recording numerous gains.

Chemical and kindred shares reflected the better trend of markets, although generally movements on balance have not exceeded more than a few pence. Imperial Chemical have been firm at 44s., at which the yield is $4\frac{1}{2}$ per cent on the basis of last year's 10 per cent dividend. Monsanto 5s. shares strengthened to 50s., Albright & Wilson were firm at 27s. 6d. awaiting the interim dividend, Boake Roberts were 28s. 9d., Brotherton 19s. 6d., F. W. Berk 12s. 6d., Amber Chemical 2s. shares 4s., and Bowman Chemical 6s. 9d. British Chemical and Biologicals 4 per cent preference have changed hands around 19s., L. B. Holliday $4\frac{1}{2}$ per cent preference were 20s. 6d., Sanitas Trust 33s. 6d., and Pest Control 5s. shares 8s. 3d. In other directions, both Laporte Chemicals 5s. ordinary at 20s. 6d., and William Blythe 3s. ordinary at 21s. have remained firm on the share bonus announcements.

Expectations of a better volume of trade with the U.S. has continued to draw attention to United Molasses, now 38s. 7½d., and Borax Consolidated, which rose further to 57s. 6d. The 4s. units of the Distillers Co. were 27s. 3d., Turner & Newall 76s. 9d., but Levers at 42s. 9d., and Lever N.V. at 44s. 9d. failed to hold earlier gains. The big capital plans led to profit-taking in Fisons ordinary shares, which fell to 37s. 6d.

Elsewhere, British Xylonite were good, advancing to 77s. 6d., but De La Rue receded to 25s. 6d. British Aluminium (43s. 3d.) and British Oxygen (93s.) have been firm.

News of record exports of cement last month put Associated Cement better at 74s., while British Portland were 71s. 10½d. Business around 14s. was recorded in British Plaster Board, Goodlass Wall firmed up to 30s. 9d., and paint shares generally were more active—Lewis Berger 4s. units standing at 25s. 9d. Metal Box shares have been firm at 95s., Triplex Glass were steady at 18s. 6d. awaiting the full results and chairman's statement.

Iron and steels improved. Dorman Long to 30s. 3d., Colvilles to 33s., Hadfields to 25s., while Consetts at 13s. 7½d., and Stewarts & Lloyds at 52s. 9d. were also better. If the nationalisation propo-

sals were dropped there would, according to the City view, be good prospects of dividends being maintained; and on this basis the shares offer good yields.

Boots Drug strengthened to 50s., Beechams deferred held their recent improvement to 13s. 3d., Sangers were 27s. 9d., Griffiths Hughes 18s., and British Drug Houses 5s. shares changed hands around 6s. 10½d.

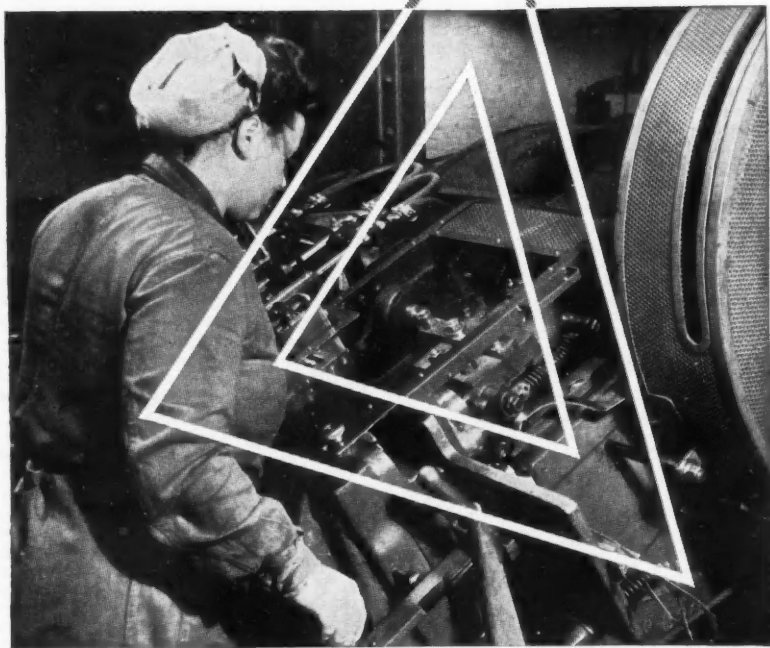
Market Reports

AMODERATELY active interest has been maintained in the chemicals market during the past week, and the movement to the chief consuming industries has continued on a fairly satisfactory scale. The only price alterations of note are those of the lead oxides which have been decreased by £1 per ton, due to a reduction in the controlled price of linseed oil, and the rise of approximately £2 6s. 6d. per ton in zinc oxide values. Among the soda products there is a steady demand for caustic soda, chlorate of soda and bicarbonate of soda and conditions in the potash chemicals section are unchanged.

MANCHESTER.—Prices of alkalis and most other leading chemicals have been maintained on the Manchester market during the past week and such changes as there were have been of little consequence. Home-trade users are taking steady deliveries against existing commitments and new bookings during the past few days have covered fair quantities in a wide range of products. Shippers' inquiries on export account have also been on a satisfactory scale. Trade in some of the fertiliser materials for the current season's requirements is gradually opening out, but in the market for the tar products business in respect of a number of items is described as dull.

GLASGOW.—The Scottish chemical market has been fairly active during the week and has revealed fairly good demand for formaldehyde, particularly for horticultural purposes. No further outstanding demand has been noted, but all classes of products have been fairly well absorbed. The position seems to have become stabilised on this basis, although during the current year there has been a gradual increase in demand for chemicals required by new industries. This particularly has affected toluol, xylol and the main acids.

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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2 at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Oxidation of aldehydes and ketones.—Distillers Co., Ltd., A. Elce, H. M. Stanley, and K. H. W. Tuerck. Dec. 8 1944. 628,084.

Electrolytic cells.—I.C.I., Ltd., and A. W. Ravenscroft. Sept. 17 1945. 627,967.

Manufacture of acetic anhydride.—Distillers Co., Ltd., A. Elce, H. M. Stanley, and K. H. W. Tuerck. Dec. 8 1944. 628,085.

Continuous distillation of solvent or volatile liquids.—Sutcliffe, Speakman & Co., Ltd., and W. E. Edwards. Feb. 26 1946. 627,838.

Production of benzofuranone derivatives.—Abbott Laboratories. March 9 1945. 627,539.

Composition of matter useful as an insecticide.—J. D. E. S. Thomas. March 26 1946. 627,976.

Manufacture of sulphur dioxide.—Ciba, Ltd. Dec. 6 1945. 627,848.

Process of making ethylene oxide, and the catalyst suitable for use in the process.—Monsanto Chemical Co. Feb. 9 1945. 627,987.

Reaction of enol esters with anhydrides.—Carbide & Carbon Chemicals Corporation. Oct. 5 1945. 627,992.

Production of cellulose esters of organic acids.—British Celanese, Ltd. Oct. 9 1945. 627,861.

Method of preparing liquid saturated chlorinated hydrocarbons.—United States Rubber Co. Dec. 15 1945. 627,993.

Manufacture of alcohol.—C. Arnold. (Standard Oil Development Co.). Dec. 2 1946. 628,002.

Manufacture of alcohol.—C. Arnold. (Standard Oil Development Co.). Dec. 2 1946. 628,003.

Process for the coagulation of dispersions of substances of high molecular weight.—N.V. De Bataafsche Petroleum Maatschappij. Dec. 13 1946. 627,884.

Process of making a furfuryl alcohol resin and the resulting product.—Haveg Corporation. March 2 1946. 627,756.

Apparatus for producing mineral wool.—National Gypsum Co. June 19 1946. 627,763.

Methods of preparing hydrocarbon-substituted halosilanes.—British Thomson-Houston Co., Ltd. Feb. 21 1946. 628,042.

Methods of preparing hydrocarbon-substituted halosilanes.—British Thomson-Houston Co., Ltd. Feb. 21 1946. 627,764.

Apparatus for producing mineral wool.—National Gypsum Co. June 19 1946. 627,765.

Process for the sulphochlorination of substituted or unsubstituted saturated hydrocarbons, or hydrocarbon mixtures consisting entirely or substantially of saturated hydrocarbons.—N.V. De Bataafsche Petroleum Maatschappij. March 22 1946. 628,014.

Production of highly-concentrated solutions of alkali hydroxide.—I.C.I., Ltd. March 9 1946. 627,767.

Production of alcohols by reduction of aldehydes.—Institute of Paper Chemistry. May 17 1944. 627,769.

Production of vinyl cyanide.—E. I. Du Pont de Nemours & Co. March 30 1946. 628,023.

Production of organic fluorine compounds.—I.C.I., Ltd., J. Chapman, and R. Roberts. April 8 1947. 627,773.

Process for the production of hydroaromatic hydrocarbons.—N.V. De Bataafsche Petroleum Maatschappij. Sept. 15 1939. 628,026.

Manufacture of diazo-dyestuffs containing copper in complex union.—Clayton Aniline Co., Ltd., J. A. Schledler, and R. Whalley. April 11 1947. 628,028.

Stabilisation of tetrahydrofuran.—E. I. Du Pont de Nemours & Co. April 20 1946. 627,897.

Production of potassium fluozirconates.—Magnesium Elektron, Ltd., H. J. Blythe, and A. L. Hock. April 29 1947. 628,050.

Method of and apparatus for re-expanding a strip of a longitudinally compressed multi-ply, creped cellulosic material.—A. F. Burgess. (Paper Patents Co.). May 2 1947. 627,785.

Catalytic hydrocarbon conversions and aluminium halide catalysts therefor.—N.V. De Bataafsche Petroleum Maatschappij. March 25 1944. 627,903.

Rubber-like compositions and methods of preparing the same.—British Thomson-Houston Co., Ltd. May 29 1946. 628,059.

Process for the refining of volatile metal or silicon chlorides.—Sorefabrik Schweizerhall. June 27 1946. 627,904.

Hydrocarbon synthesis process.—Standard Oil Development Co. Nov. 22 1946. 627,905.

Manufacture of organofluorosiloxane products. Dow Chemical Co. July 8 1946. 627,800.

Process for protecting metals against corrosion, anti-corrosive packing material and the manufacture thereof.—N.V. De Bataafsche Petroleum Maatschappij. May 7 1946. 627,801.

Process for the manufacture of organo-silicon compounds.—Dow Corning Corporation, and J. T. Goodwin, Jun. July 1 1947. 627,809.

Production of acetic anhydride.—D. T. Cross. (Standard Oil Development Co.). July 3 1947. 627,810.

Preparation of β -phthalimido propane derivatives and β -alanine.—Nopco Chemical Co. July 25 1946. 627,816.

Methods of making organo siloxanes.—Dow Corning Corporation. Feb. 26 1942. 628,070.

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SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order

OIL TESTING SHIFT CHEMIST required by Persian Gulf Oil Company. Must possess Inter B.Sc. or Higher National Certificate in General Science with Chemistry as main subject. Must be familiar with testing and simple analysis and inspection of crude petroleum and products. Experience in laboratory control and oil refinery processing preferred but experience of testing for laboratory control of chemical processes considered. Age under 35. Salary according to age and experience, tax free. Messing and accommodation free. Kit allowance. Write giving brief details age, experience, etc., and quoting K.1015 to Box B.C. c/o J. W. Vickers & Co., Ltd., 7/3, Great Winchester Street, London, E.C.2.

YOUNG MAN (22-25 years), required with training in heat transfer, fluid flow and combustion to act as assistant in the Services Department of a large chemical and metallurgical factory in the outer London area. State age, training and salary required. Box 2839, The Chemical Age, 154, Fleet Street, London, E.C.4.

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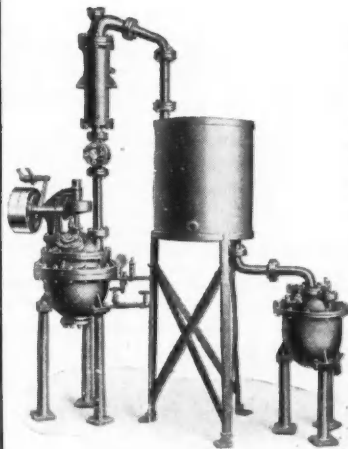


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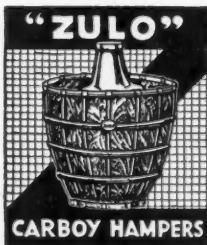


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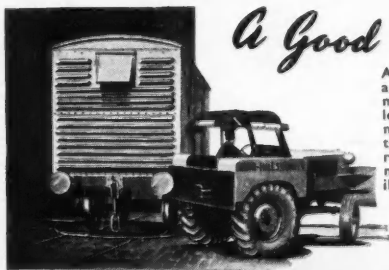
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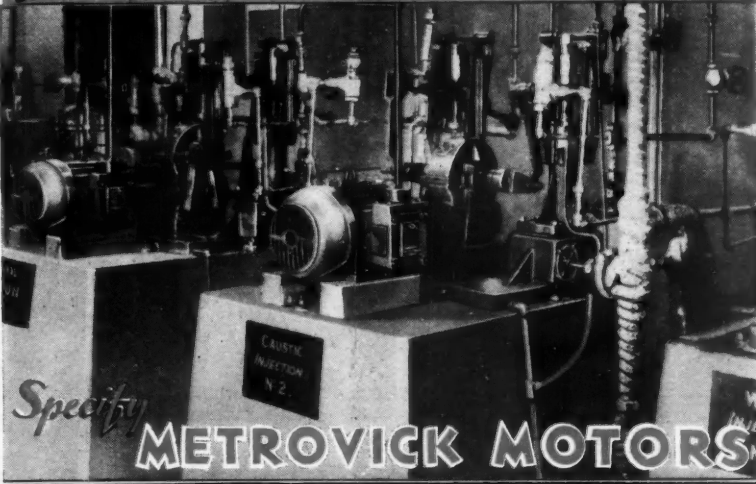
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